Programmable Temperature Controller (Digital Controller)

E5EC-T/E5AC-T (48 × 96 mm/96 × 96 mm)

Programmable Controllers Join the E5□C Series!

Program up to 256 segments can handle a wide variety of applications.

- Set up to 8 Programs (Patterns) with 32 Segments (Steps) Each
- A white LCD PV display with a height of approx. 18 mm for the E5EC-T and 25 mm for the E5AC-T improves visibility.
- Tool ports are provided both on the top panel and the front panel. Set up the Controller without wiring the power supply by connecting to the computer with a Communications Conversion Cable (sold separately). Setup is easy with the CX-Thermo (sold separately).
- High-speed sampling at 50 ms.
- Models are available with up to 4 auxiliary outputs, up to 6 event inputs, and a transfer output to cover a wide range of applications.
- Short body with depth of only 60 mm.
- Easy connections to a PLC with programless communications. Use component communications to link Temperature Controllers to each other.
- The new position-proportional control models allow you to control valves as well. (The position-proportional control models are scheduled to be released in May, 2014.)

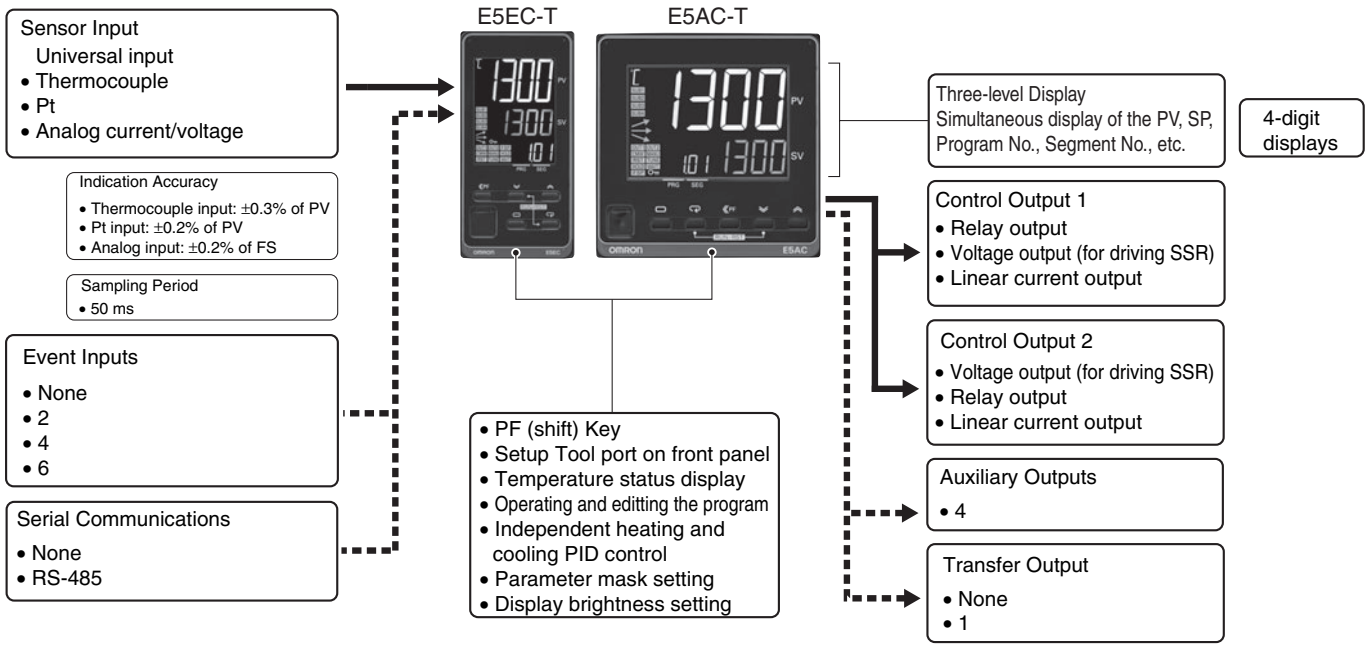
48 × 96 mm
E5EC-T

96 × 96 mm
E5AC-T

Refer to your OMRON website for the most recent information on applicable safety standards.

Refer to Safety Precautions on page 104.

Main I/O Functions



This datasheet is provided as a guideline for selecting products.
Be sure to refer to the following manuals for application precautions and other information required for operation before attempting to use the product.

E5□C-T Digital Temperature Controllers Programmable Type User's Manual (Cat. No. H185)
E5□C-T Digital Temperature Controllers Programmable Type Communications Manual (Cat. No. H186)

Model Number Legend and Standard Models

Model Number Legend

●Models with Screw Terminals

E5EC-T□□ 4 □ 5 M-□□□ (Example: E5EC-TRX4A5M-000)

① ② ③ ④ ⑤ ⑥

E5AC-T□□ 4 □ 5 M-□□□ (Example: E5AC-TRX4A5M-000)

① ② ③ ④ ⑤ ⑥

Model	① Control outputs 1 and 2	② No. of auxiliary outputs	③ Power supply voltage	④ Terminal type	⑤ Input type	⑥ Options	Meaning	
E5EC-T							48 × 96 mm Programmable Type	
E5AC-T							96 × 96 mm Programmable Type	
							Control output 1	Control output 2
	RX						Relay output	None
	QX						Voltage output (for driving SSR)	None
*2	CX						Linear current output	None
	QQ						Voltage output (for driving SSR)	Voltage output (for driving SSR)
	QR						Voltage output (for driving SSR)	Relay output
	RR						Relay output	Relay output
*2	CC						Linear current output	Linear current output
*2	CQ						Linear current output	Voltage output (for driving SSR)
	PR						Position-proportional relay output	Position-proportional relay output
		4					4 (auxiliary outputs 1 and 2 with same common and auxiliary outputs 3 and 4 with same common)	
			A				100 to 240 VAC	
			D				24 VAC/DC	
				5			Screw terminals (with cover)	
					M		Universal input	

Option selection conditions *1	Control outputs 1 and 2				HB alarm and HS alarm	Communications	Event inputs	Transfer output
	For RX, QX, QQ, QR, RR, or CQ	For CX or CC	For PR					
	Selectable	Selectable	Selectable	000	---	---	---	---
		Selectable	Selectable	004	---	RS-485	2	---
		Selectable		005	---	---	4	---
	Selectable			008	1	RS-485	2	---
	Selectable			010	1	---	4	---
	Selectable			019	1	---	6	Provided.
		Selectable		021	---	---	6	Provided.
		Selectable	Selectable	022	---	RS-485	4	Provided.

*1. The options that can be selected depend on the type of control output.
*2. The linear current output cannot be used as a transfer output.

Heating and Cooling Control

●Using Heating and Cooling Control

① Control Output Assignment
If there is no control output 2, an auxiliary output is used as the cooling control output.
If there is a control output 2, the two control outputs are used for heating and cooling.
(It does not matter which output is used for heating and which output is used for cooling.)
② Control
If PID control is used, you can set PID control separately for heating and cooling.
This allows you to handle control systems with different heating and cooling response characteristics.

Optional Products (Order Separately)

USB-Serial Conversion Cable

Model
E58-CIFQ2

Communications Conversion Cable

Model
E58-CIFQ2-E

Note: Always use this product together with the E58-CIFQ2. This Cable is used to connect to the front-panel Setup Tool port.

Terminal Covers

Model
E53-COV24 (3pcs)

Note: The Terminal Covers E53-COV24 are provided with the Digital Temperature Controller.

Waterproof Packing

Applicable Controller	Model
E5EC-T	Y92S-P9
E5AC-T	Y92S-P10

Note: This Waterproof Packing is provided with the Digital Temperature Controller.

Waterproof Cover

Applicable Controller	Model
E5EC-T	Y92A-49N
E5AC-T	Y92A-96N

Front Port Cover

Model
Y92S-P7

Note: This Front Port Cover is provided with the Digital Temperature Controller.

Mounting Adapter

Model
Y92F-51 (2pcs)

Note: This Mounting Adapter is provided with the Digital Temperature Controller.

Current Transformers (CTs)

Hole diameter	Model
5.8 mm	E54-CT1
12.0 mm	E54-CT3

CX-Thermo Support Software

Model
EST2-2C-MV4

Note: CX-Thermo version 4.61 or higher is required for the E5EC-T/E5AC-T.
For the system requirements for the CX-Thermo, refer to information on the EST2-2C-MV4 on the OMRON website (www.ia.omron.com).

Specifications

Ratings

Power supply voltage			A in model number: 100 to 240 VAC, 50/60 Hz D in model number: 24 VAC, 50/60 Hz; 24 VDC
Operating voltage range			85% to 110% of rated supply voltage
Power consumption		**E5EC-T**	8.7 VA max. at 100 to 240 VAC, and 5.5 VA max. at 24 VAC or 3.2 W max. at 24 VDC
		E5AC-T	9.0 VA max. at 100 to 240 VAC, and 5.6 VA max. at 24 VAC or 3.4 W max. at 24 VDC
Sensor input			Temperature input Thermocouple: K, J, T, E, L, U, N, R, S, B, W, or PL II Platinum resistance thermometer: Pt100 or JPt100 Infrared temperature sensor (ES1B): 10 to 70°C, 60 to 120°C, 115 to 165°C, or 140 to 260°C Analog input Current input: 4 to 20 mA or 0 to 20 mA Voltage input: 1 to 5 V, 0 to 5 V, or 0 to 10 V
Input impedance			Current input: 150 Ω max., Voltage input: 1 MΩ min. (Use a 1:1 connection when connecting the ES2-HB/THB.)
Control method			2-PID control (with auto-tuning) or ON/OFF control
Control output	**Relay output**		SPST-NO, 250 VAC, 5 A (resistive load), electrical life: 100,000 operations, minimum applicable load: 5 V, 10 mA (reference value)
	Voltage output (for driving SSR)		Output voltage: 12 VDC ±20% (PNP), max. load current: 40 mA, with short-circuit protection circuit (The maximum load current is 21 mA for models with two control outputs.)
	Linear current output		4 to 20 mA DC/0 to 20 mA DC, load: 500 Ω max., resolution: approx. 10,000
Auxiliary output	**Number of outputs**		4
	Output specifications		SPST-NO. relay outputs, 250 VAC, Models with 4 outputs: 2 A (resistive load), Electrical life: 100,000 operations, Minimum applicable load: 10 mA at 5 V (reference value)
Event input	**Number of inputs**		2, 4 or 6 (depends on model)
	External contact input specifications		Contact input: ON: 1 kΩ max., OFF: 100 kΩ min.
			Non-contact input: ON: Residual voltage: 1.5 V max., OFF: Leakage current: 0.1 mA max.
			Current flow: Approx. 7 mA per contact
Transfer output	**Number of outputs**		1 (only on models with a transfer output)
	Output specifications		Current output: 4 to 20 mA DC, Load: 500 Ω max., Resolution: Approx. 10,000 Linear voltage output: 1 to 5 VDC, load: 1 kΩ min., Resolution: Approx. 10,000
Potentiometer input			100 Ω to 10 kΩ
Setting method			Digital setting using front panel keys
Indication method			11-segment digital display and individual indicators Character height: E5EC-T: PV: 18.0 mm, SV: 11.0 mm, MV: 7.8 mm E5AC-T: PV: 25.0 mm, SV: 15.0 mm, MV: 9.5 mm Three displays. Contents: PV, SP, program No. and segment No., remaining segment time, or MV (valve opening) Numbers of digits: 4 digits
Bank switching			None
Other functions			Manual output, heating/cooling control, loop burnout alarm, other alarm functions, heater burnout (HB) alarm (including SSR failure (HS) alarm), 40% AT, 100% AT, MV limiter, input digital filter, robust tuning, PV input shift, protection functions, extraction of square root, MV change rate limit, logic operations, temperature status display, moving average of input value, and display brightness setting
Ambient operating temperature			−10 to 55°C (with no condensation or icing), For 3-year warranty: −10 to 50°C with standard mounting (with no condensation or icing)
Ambient operating humidity			25% to 85%
Storage temperature			−25 to 65°C (with no condensation or icing)
Altitude			2,000 m max.
Recommended fuse			T2A, 250 VAC, time-lag, low-breaking capacity
Installation environment			Installation Category II, Pollution Degree 2 (IEC 61010-1 compliant)

Input Ranges

●Thermocouple/Platinum Resistance Thermometer (Universal inputs)

Sensor type	Platinum resistance thermometer					Thermocouple															Infrared temperature sensor			
Sensor specification	Pt100			JPt100		K		J		T		E	L	U		N	R	S	B	W	PLII	10 to 70°C	60 to 120°C	115 to 165°C	140 to 260°C
Temperature range (°C)	850 / -200	500.0 / -199.9	100.0 / 0.0	500.0 / 199.9	100.0 / 0.0	1300 / -200	500.0 / -20.0	850 / -100	400.0 / -20.0	400 / -200	400.0 / -199.9	600 / -200	850 / -100	400 / -200	400.0 / -199.9	1300 / -200	1700 / 0	1700 / 0	1800 / 100	2300 / 0	1300 / 0	90 / 0	120 / 0	165 / 0	260 / 0
Set value	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24

Shaded settings are the default settings.

The applicable standards for the input types are as follows:

K, J, T, E, N, R, S, B: JIS C 1602-1995, IEC 60584-1
L: Fe-CuNi, DIN 43710-1985
U: Cu-CuNi, DIN 43710-1985
W: W5Re/W26Re, ASTM E988-1990
JPt100: JIS C 1604-1989, JIS C 1606-1989
Pt100: JIS C 1604-1997, IEC 60751
PL II: According to Platinel II electromotive force charts from BASF (previously Engelhard)

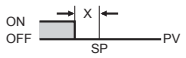
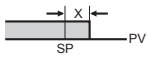
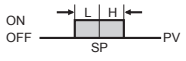
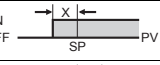
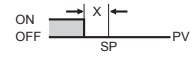
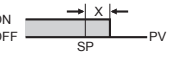
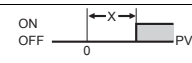
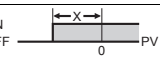
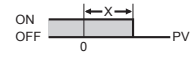
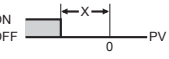
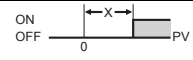
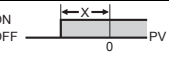
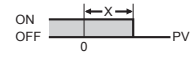
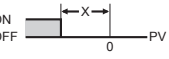
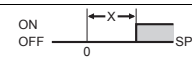
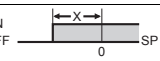
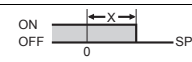
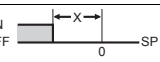
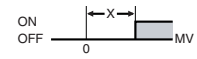
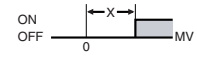
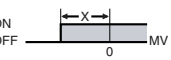
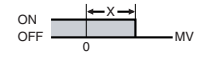
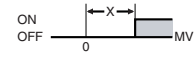
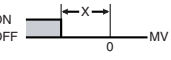
●Analog input

Input type	Current		Voltage		
Input specification	4 to 20 mA	0 to 20 mA	1 to 5 V	0 to 5 V	0 to 10 V
Setting range	Usable in the following ranges by scaling: -1999 to 9999, -199.9 to 999.9, -19.99 to 99.99 or -1.999 to 9.999				
Set value	25	26	27	28	29

Alarm Types

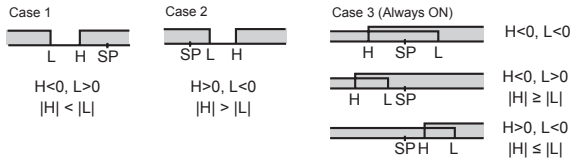
Each alarm can be independently set to one of the following 17 alarm types. The default is 2: Upper limit. (see note.)
Auxiliary outputs are allocated for alarms. ON delays and OFF delays (0 to 999 s) can also be specified.

Note: In the default settings for models with HB or HS alarms, alarm 1 is set to a heater alarm (HA) and the Alarm Type 1 parameter is not displayed. To use alarm 1, set the output assignment to alarm 1.

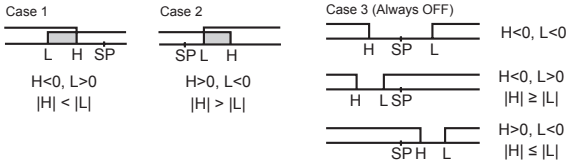
Set value	Alarm type	Alarm output operation		Description of function
		When alarm value X is positive	When alarm value X is negative	
0	Alarm function OFF	Output OFF		No alarm
1	Upper- and lower-limit *1		*2	Set the upward deviation in the set point for the alarm upper limit (H) and the lower deviation in the set point for the alarm lower limit (L). The alarm is ON when the PV is outside this deviation range.
2 (default)	Upper-limit			Set the upward deviation in the set point by setting the alarm value (X). The alarm is ON when the PV is higher than the SP by the deviation or more.
3	Lower-limit			Set the downward deviation in the set point by setting the alarm value (X). The alarm is ON when the PV is lower than the SP by the deviation or more.
4	Upper- and lower-limit range *1		*3	Set the upward deviation in the set point for the alarm upper limit (H) and the lower deviation in the set point for the alarm lower limit (L). The alarm is ON when the PV is inside this deviation range.
5	Upper- and lower-limit with standby sequence *1 *5		*4	A standby sequence is added to the upper- and lower-limit alarm (1). *6
6	Upper-limit with standby sequence			A standby sequence is added to the upper-limit alarm (2). *6
7	Lower-limit with standby sequence			A standby sequence is added to the lower-limit alarm (3). *6
8	Absolute-value upper-limit			The alarm will turn ON if the process value is larger than the alarm value (X) regardless of the set point.
9	Absolute-value lower-limit			The alarm will turn ON if the process value is smaller than the alarm value (X) regardless of the set point.
10	Absolute-value upper-limit with standby sequence			A standby sequence is added to the absolute-value upper-limit alarm (8). *6
11	Absolute-value lower-limit with standby sequence			A standby sequence is added to the absolute-value lower-limit alarm (9). *6
12	LBA (alarm 1 type only)	-		*7
13	PV change rate alarm	-		*8
14	SP absolute-value upper-limit alarm			This alarm type turns ON the alarm when the set point (SP) is higher than the alarm value (X).
15	SP absolute-value lower-limit alarm			This alarm type turns ON the alarm when the set point (SP) is lower than the alarm value (X).
16	MV absolute-value upper-limit alarm *9	Standard Control  Heating/Cooling Control (Heating MV) 	Standard Control  Heating/Cooling Control (Heating MV) Always ON	This alarm type turns ON the alarm when the manipulated variable (MV) is higher than the alarm value (X).
17	MV absolute-value lower-limit alarm *9	Standard Control  Heating/Cooling Control (Cooling MV) 	Standard Control  Heating/Cooling Control (Cooling MV) Always ON	This alarm type turns ON the alarm when the manipulated variable (MV) is lower than the alarm value (X).

*1 With set values 1, 4 and 5, the upper and lower limit values can be set independently for each alarm type, and are expressed as “L” and “H.”

*2 Set value: 1, Upper- and lower-limit alarm



*3 Set value: 4, Upper- and lower-limit range



*4 Set value: 5, Upper- and lower-limit with standby sequence
For Upper- and Lower-Limit Alarm Described Above *2

- Case 1 and 2
  Always OFF when the upper-limit and lower-limit hysteresis overlaps.
- Case 3: Always OFF

*5. Set value: 5, Upper- and lower-limit with standby sequence
Always OFF when the upper-limit and lower-limit hysteresis overlaps.

*6 Refer to the *E5□C-T Digital Temperature Controllers Programmable Type User's Manual* (Cat. No. H185) for information on the operation of the standby sequence.

*7 Refer to the *E5□C-T Digital Temperature Controllers Programmable Type User's Manual* (Cat. No. H185) for information on the loop burnout alarm (LBA). This setting cannot be used with a position-proportional model.

*8 Refer to the *E5□C-T Digital Temperature Controllers Programmable Type User's Manual* (Cat. No. H185) for information on the PV change rate alarm.

*9 When heating/cooling control is performed, the MV absolute upper limit alarm functions only for the heating operation and the MV absolute lower limit alarm functions only for the cooling operation.

Characteristics

Indication accuracy (at the ambient temperature of 23°C)			Thermocouple: (±0.3% of indication value or ±1°C, whichever is greater) ±1 digit max. *1 Platinum resistance thermometer: (±0.2% of indication value or ±0.8°C, whichever is greater) ±1 digit max. Analog input: ±0.2% FS ±1 digit max. CT input: ±5% FS ±1 digit max. Potentiometer input: ±5% FS ±1 digit max.
Transfer output accuracy			±0.3% FS max.
Influence of temperature *2			Thermocouple input (R, S, B, W, PL II): (±1% of indication value or ±10°C, whichever is greater) ±1 digit max. Other thermocouple input: (±1% of indication value or ±4°C, whichever is greater) ±1 digit max. *3 Platinum resistance thermometer: (±1% of indication value or ±2°C, whichever is greater) ±1 digit max. Analog input: ±1%FS ±1 digit max. CT input: ±5% FS ±1 digit max.
Influence of voltage *2			
Input sampling period			50ms
Hysteresis			Temperature input: 0.1 to 999.9°C or °F (in units of 0.1°C or°F) Analog input: 0.01% to 99.99% FS (in units of 0.01% FS)
Proportional band (P)			Temperature input: 0.1 to 999.9°C or °F (in units of 0.1°C or °F) Analog input: 0.1 to 999.9% FS (in units of 0.1% FS)
Integral time (I)			Standard, heating/cooling, or Position-proportional (Close): 0 to 9999 s (in units of 1 s), 0.0 to 999.9 s (in units of 0.1 s) Position-proportional (Floating): 1 to 9999 s (in units of 1 s), 0.1 to 999.9 s (in units of 0.1 s)*4
Derivative time (D)			0 to 9999 s (in units of 1 s), 0.0 to 999.9 s (in units of 0.1 s) *4
Proportional band (P) for cooling			Temperature input: 0.1 to 999.9°C or °F (in units of 0.1°C or °F) Analog input: 0.1 to 999.9% FS (in units of 0.1% FS)
Integral time (I) for cooling			0 to 9999 s (in units of 1 s), 0.0 to 999.9 s (in units of 0.1 s) *4
Derivative time (D) for cooling			0 to 9999 s (in units of 1 s), 0.0 to 999.9 s (in units of 0.1 s) *4
Control period			0.1, 0.2, 0.5, 1 to 99 s (in units of 1 s)
Manual reset value			0.0 to 100.0% (in units of 0.1%)
Alarm setting range			-1999 to 9999 (decimal point position depends on input type)
Influence of signal source resistance			Thermocouple: 0.1°C/Ω max. (100 Ω max.) Platinum resistance thermometer: 0.1°C/Ω max. (10 Ω max.)
Insulation resistance			20 MΩ min. (at 500 VDC)
Dielectric strength			3,000 VAC, 50/60 Hz for 1 min between terminals of different charge
Vibration	**Malfunction**		10 to 55 Hz, 20 m/s^2 for 10 min each in X, Y, and Z directions
	Resistance		10 to 55 Hz, 20 m/s^2 for 2 hrs each in X, Y, and Z directions
Shock	**Malfunction**		100 m/s^2, 3 times each in X, Y, and Z directions
	Resistance		300 m/s^2, 3 times each in X, Y, and Z directions
Weight		**E5EC-T**	Controller: Approx. 210 g, Adapter: Approx. 4 g × 2
		E5AC-T	Controller: Approx. 250 g, Adapter: Approx. 4 g × 2
Degree of protection			Front panel: IP66, Rear case: IP20, Terminals: IP00
Memory protection			Non-volatile memory (number of writes: 1,000,000 times)
Setup Tool			CX-Thermo version 4.61 or higher
Setup Tool port			E5EC-T/E5AC-T top panel: An E58-CIFQ2 USB-Serial Conversion Cable is used to connect to a USB port on the computer.*5 E5EC-T/E5AC-T front panel: An E58-CIFQ2 USB-Serial Conversion Cable and E58-CIFQ2-E Conversion Cable are used together to connect to a USB port on the computer.*5
Standards	**Approved standards**		UL 61010-1, Korean Radio Waves Act (Act 10564)
	Conformed standards		EN 61010-1 (IEC 61010-1): Pollution Degree 2, overvoltage category II
EMC			EMI: EN61326 Radiated Interference Electromagnetic Field Strength: EN 55011 Group 1, class A Noise Terminal Voltage: EN 55011 Group 1, class A EMS: EN 61326 ESD Immunity: EN 61000-4-2 Electromagnetic Field Immunity: EN 61000-4-3 Burst Noise Immunity: EN 61000-4-4 Conducted Disturbance Immunity: EN 61000-4-6 Surge Immunity: EN 61000-4-5 Voltage Dip/Interrupting Immunity: EN 61000-4-11

*1 The indication accuracy of K thermocouples in the -200 to 1300°C range, T and N thermocouples at a temperature of -100°C max., and U and L thermocouples at any temperatures is ±2°C ±1 digit max. The indication accuracy of the B thermocouple at a temperature of 400°C max. is not specified. The indication accuracy of B thermocouples at a temperature of 400 to 800°C is ±3°C max. The indication accuracy of the R and S thermocouples at a temperature of 200°C max. is ±3°C ±1 digit max. The indication accuracy of W thermocouples is (±0.3% of PV or ±3°C, whichever is greater) ±1 digit max. The indication accuracy of PL II thermocouples is (±0.3% of PV or ±2°C, whichever is greater) ±1 digit max.
*2 Ambient temperature: -10°C to 23°C to 55°C, Voltage range: -15% to 10% of rated voltage
*3 K thermocouple at -100°C max.: ±10°C max.
*4 The unit is determined by the setting of the Integral/Derivative Time Unit parameter.
*5 External communications (RS-485) and USB-serial conversion cable communications can be used at the same time.

Program Control

Number of programs (patterns)		8
Number of segments (steps)		32
Segment setting method		Time setting (Segment set with set point and time.)
		Slope setting (Segment set with segment type, set point, slope, and time.)
Segment times		0 h 0 min to 99 h 59 min
		0 min 0 s to 99 min 59 s
Alarm setting		Set separately for each program.
Reset operation		Select either stopping control or fixed SP operation.
Startup operation		Select continuing, resetting, manual operation, or run mode.
PID sets	**Number of sets**	8
	Setting method	Set separately for each program (automatic PID group selection also supported).
Alarm SP function		Select from ramp SP and target SP.
Program status control	**Segment operation**	Advance, segment jump, hold, and wait
	Program operation	Program repetitions and program links
Wait operation	**Wait method**	Waiting at segment ends
	Wait width setting	Same wait width setting for all programs
Time signals	**Number of outputs**	2
	Number of ON/OFF Operations	1 each per output
	Setting method	Set separately for each program.
Program status output		Program end output (pulse width can be set), run output, stage output
Program startup operation	**PV start**	Select from segment 1 set point, slope-priority PV start
	Standby	0 h 0 min to 99 h 59 min
		0 day 0 h to 99 day 23h
Operation end operation		Select from resetting, continuing control at final set point, and fixed SP control.
Program SP shift		Same program SP shift for all programs

USB-Serial Conversion Cable

Applicable OS	Windows XP/Vista/7/8
Applicable software	CX-Thermo version 4.61 or higher
Applicable models	E5□C-T Series, E5□C Series, and E5CB Series
USB interface standard	Conforms to USB Specification 2.0.
DTE speed	38400 bps
Connector specifications	Computer: USB (type A plug) Digital Temperature Controller: Special serial connector
Power supply	Bus power (Supplied from USB host controller.)*
Power supply voltage	5 VDC
Current consumption	450 mA max.
Output voltage	4.7±0.2 VDC (Supplied from USB-Serial Conversion Cable to the Digital Temperature Controller.)
Output current	250 mA max. (Supplied from USB-Serial Conversion Cable to the Digital Temperature Controller.)
Ambient operating temperature	0 to 55°C (with no condensation or icing)
Ambient operating humidity	10% to 80%
Storage temperature	-20 to 60°C (with no condensation or icing)
Storage humidity	10% to 80%
Altitude	2,000 m max.
Weight	Approx. 120 g

Windows is a registered trademark of Microsoft Corporation in the United States and or other countries.

* Use a high-power port for the USB port.

Note: A driver must be installed on the computer. Refer to the *Instruction Manual* included with the Cable for the installation procedure.

Communications Specifications

Transmission line connection method	RS-485: Multidrop
Communications	RS-485 (two-wire, half duplex)
Synchronization method	Start-stop synchronization
Protocol	CompoWay/F, or Modbus
Baud rate*	9600, 19200, 38400, or 57600 bps
Transmission code	ASCII
Data bit length*	7 or 8 bits
Stop bit length*	1 or 2 bits
Error detection	Vertical parity (none, even, odd) Block check character (BCC) with CompoWay/F or CRC-16 Modbus
Flow control	None
Interface	RS-485
Retry function	None
Communications buffer	217 bytes
Communications response wait time	0 to 99 ms Default: 20 ms

* The baud rate, data bit length, stop bit length, and vertical parity can be individually set using the Communications Setting Level.

Communications Functions

Programless communications*1	You can use the memory in the PLC to read and write E5□C-T parameters, start and reset operation, etc. The E5□C-T automatically performs communications with PLCs. No communications programming is required. Number of connected Digital Temperature Controllers: 32 max. Applicable PLCs OMRON PLCs CS Series, CJ Series, or CP Series Mitsubishi Electric PLCs MELSEC Q Series, L Series
Component Communications	When Digital Temperature Controllers are connected, set points and RUN/STOP commands can be sent from the Digital Temperature Controller that is set as the master to the Digital Temperature Controllers that are set as slaves. Slope and offsets can be set for the set point. Number of connected Digital Temperature Controllers: 32 max. (including master)
Copying*1	When Digital Temperature Controllers are connected, the parameters can be copied from the Digital Temperature Controller that is set as the master to the Digital Temperature Controllers that are set as slaves.

MELSEC is a registered trademark of Mitsubishi Electric Corporation.

*1 Both the programless communications and the component communications support the copying.

Current Transformer (Order Separately) Ratings

Dielectric strength	1,000 VAC for 1 min
Vibration resistance	50 Hz, 98 m/s^2
Weight	E54-CT1: Approx. 11.5 g, E54-CT3: Approx. 50 g
Accessories (E54-CT3 only)	Armatures (2) Plugs (2)

Heater Burnout Alarms and SSR Failure Alarms

CT input (for heater current detection)	Models with detection for single-phase heaters: One input
Maximum heater current	50 A AC
Input current indication accuracy	±5% FS ±1 digit max.
Heater burnout alarm setting range *1	0.1 to 49.9 A (in units of 0.1 A) Minimum detection ON time: 100 ms *3
SSR failure alarm setting range *2	0.1 to 49.9 A (in units of 0.1 A) Minimum detection OFF time: 100 ms *4

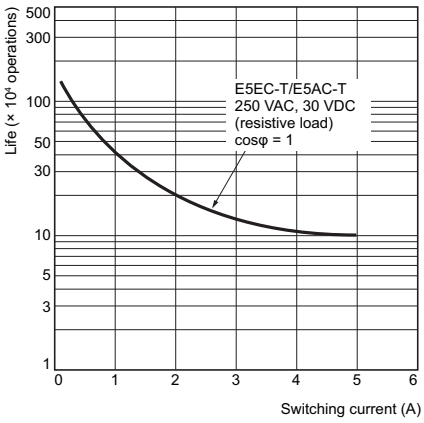
*1 For heater burnout alarms, the heater current will be measured when the control output is ON, and the output will turn ON if the heater current is lower than the set value (i.e., heater burnout detection current value).

*2 For SSR failure alarms, the heater current will be measured when the control output is OFF, and the output will turn ON if the heater current is higher than the set value (i.e., SSR failure detection current value).

*3 The value is 30 ms for a control period of 0.1 s or 0.2 s.

*4 The value is 35 ms for a control period of 0.1 s or 0.2 s.

Electrical Life Expectancy Curve for Relays (Reference Values)



External Connections

E5EC-T/E5AC-T

E5EC - T□□ 4 □ 5 M - □□□
(1) (2) (3) (4) (5) (6)
Terminal type

E5AC - T□□ 4 □ 5 M - □□□
(1) (2) (3) (4) (5) (6)
Terminal type

Control output 1
Relay output
250 VAC, 5A (resistive load)
Voltage output (for driving SSR)
12 VDC, 40 mA
21 mA if there are two control outputs
Linear current output
0 to 20 mA DC
4 to 20 mA DC
Load: 500 Ω max.

Control output 2
Relay output
250 VAC, 5 A (resistive load)
Voltage output (for driving SSR)
12 VDC, 21 mA
Linear current output
0 to 20 mA DC
4 to 20 mA DC
Load: 500 Ω max.

Auxiliary outputs
Relay output
Models with 4 auxiliary outputs:
250 VAC, 2 A (resistive load)

(1)Control Outputs

RX — Models with 1 Relay Output
QX — Models with 1 Voltage Output (for Driving SSR)
CX — Models with 1 Linear Current Output
QQ — Models with 2 Voltage Outputs (for Driving SSR)
QR — Models with Voltage Output (for Driving SSR) and Relay Output
RR/PR — Models with 2 Relay Outputs
CC — Models with 2 Linear Current Outputs
CQ — Models with 2 Output: Linear Current Output and Voltage (for Driving SSR)

(2) Auxiliary Outputs
Auxiliary outputs 1 to 4
Auxiliary output 4
Auxiliary output 3
Auxiliary output 2
Auxiliary output 1

(3) Input Power Supply
100 to 240 VAC
24 VAC/DC (no polarity)

(5) Sensor (Temperature/Analog) Input
TC
Pt
I
V

Potentiometer input

(6) Options
004 Communications and two event inputs
005 Four event inputs
008 Communications, two event inputs, and one CT
010 Four event inputs and one CT
019 Six event inputs, one CT, and transfer output
021 Six event inputs and transfer output
022 Communications, four event inputs, and transfer output

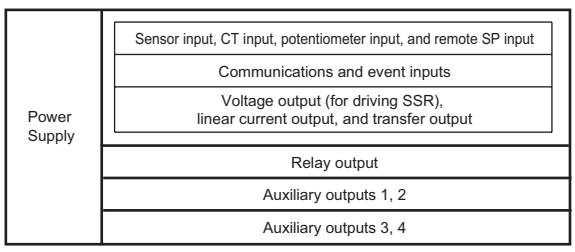
The E5□C-T is set for a K-type thermocouple (input type = 5) by default. An input error (5.ERR) will not occur if the input type setting does not agree with the temperature sensor. Check the input type.

* The position-proportional control models (E5EC-TPR□□□M-□□□) will be released in May 2014.

Note: **1.** The application of the terminals depends on the model.
2. Do not wire the terminals that are shown with a gray background.
3. When complying with EMC standards, the cable that connects the sensor must be 30 m or less. If the cable length exceeds 30 m, compliance with EMC standards will not be possible.
4. Connect M3 crimped terminals.

Isolation/Insulation Block Diagrams

Models with 4 Auxiliary Outputs


Power Supply
Sensor input, CT input, potentiometer input, and remote SP input
Communications and event inputs
Voltage output (for driving SSR), linear current output, and transfer output
Relay output
Auxiliary outputs 1, 2
Auxiliary outputs 3, 4

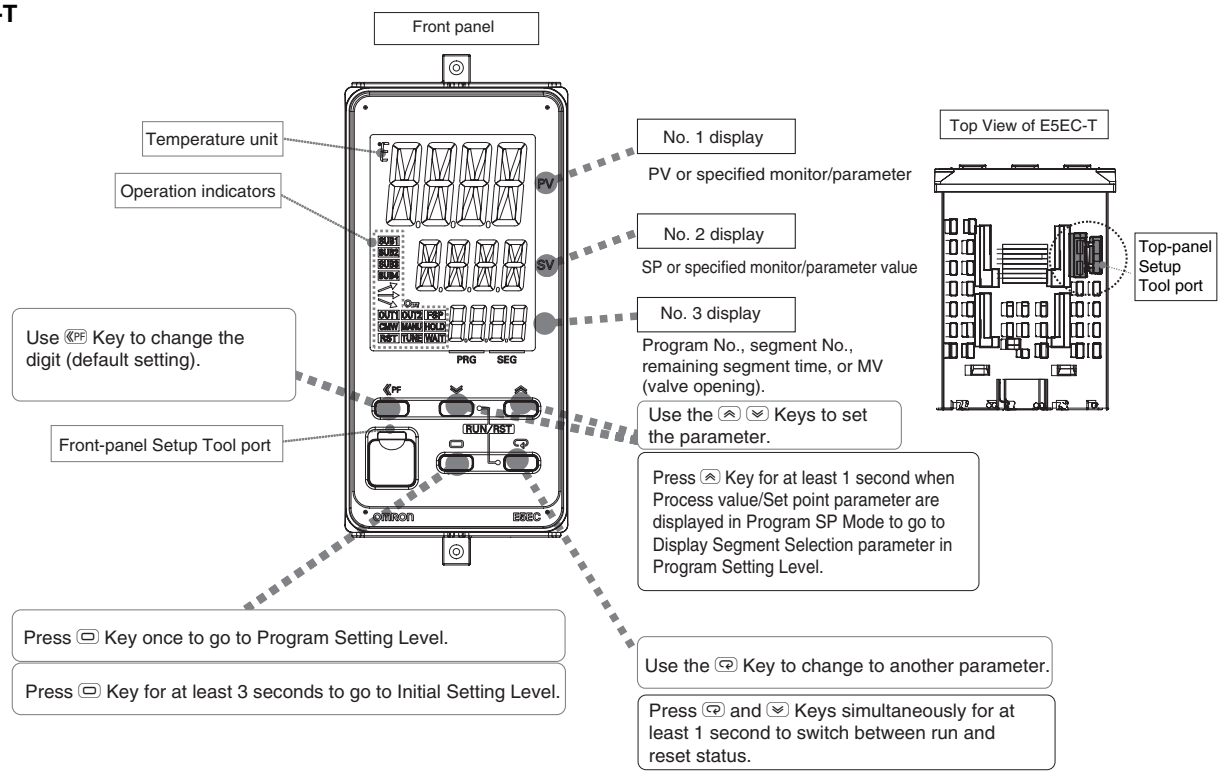
: Reinforced insulation

: Functional isolation

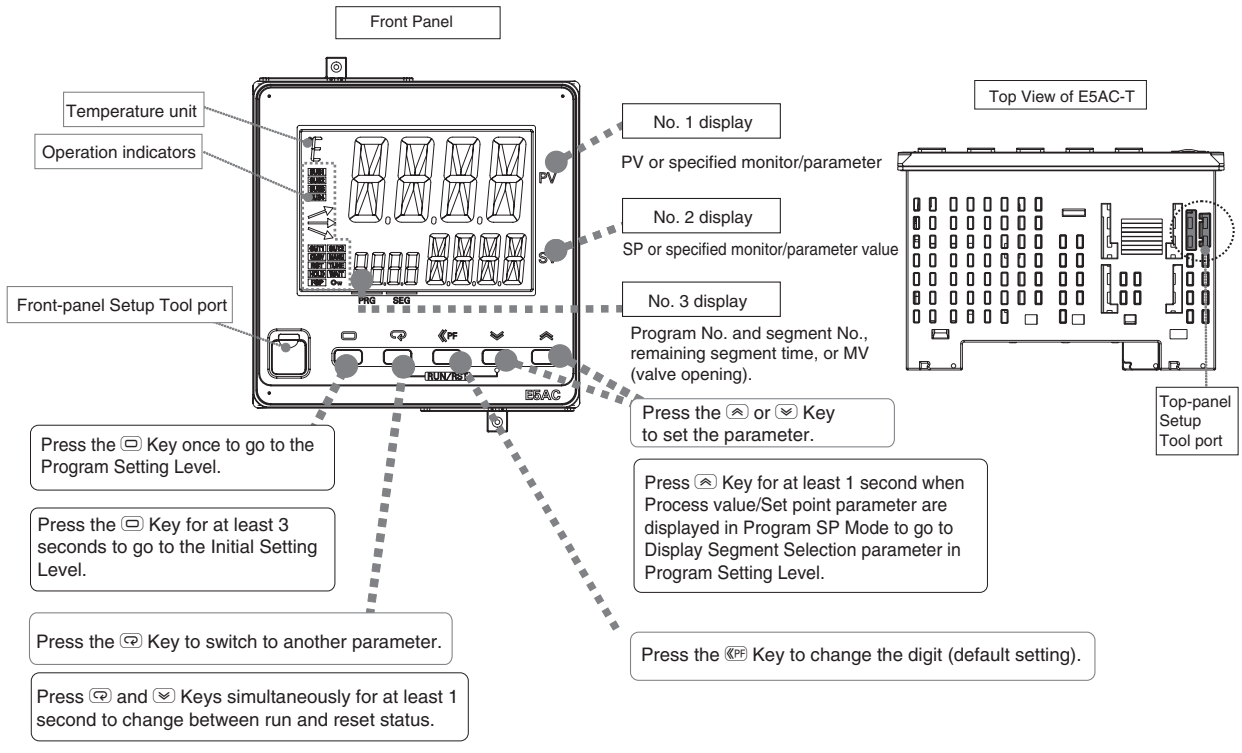
Note: Auxiliary outputs 1 to 2 and 3 to 4 are not insulated.

Nomenclature

E5EC-T


Front panel
Temperature unit
Operation indicators
Use PF Key to change the digit (default setting).
Front-panel Setup Tool port
No. 1 display
PV or specified monitor/parameter
No. 2 display
SP or specified monitor/parameter value
No. 3 display
Program No., segment No., remaining segment time, or MV (valve opening).
Use the Keys to set the parameter.
Press Key for at least 1 second when Process value/Set point parameter are displayed in Program SP Mode to go to Display Segment Selection parameter in Program Setting Level.
Top View of E5EC-T
Top-panel Setup Tool port
Press Key once to go to Program Setting Level.
Press Key for at least 3 seconds to go to Initial Setting Level.
Use the Key to change to another parameter.
Press and Keys simultaneously for at least 1 second to switch between run and reset status.

E5AC-T

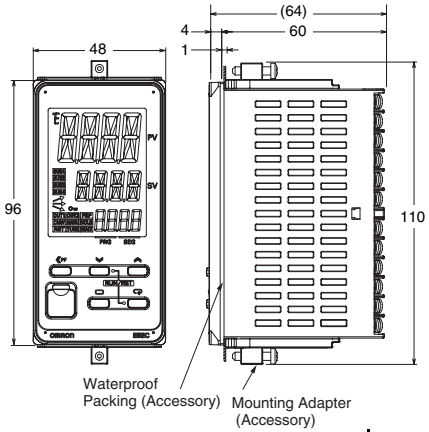

Front Panel
Temperature unit
Operation indicators
Front-panel Setup Tool port
No. 1 display
PV or specified monitor/parameter
No. 2 display
SP or specified monitor/parameter value
No. 3 display
Program No. and segment No., remaining segment time, or MV (valve opening).
Press the or Key to set the parameter.
Press Key for at least 1 second when Process value/Set point parameter are displayed in Program SP Mode to go to Display Segment Selection parameter in Program Setting Level.
Top View of E5AC-T
Top-panel Setup Tool port
Press the Key once to go to the Program Setting Level.
Press the Key for at least 3 seconds to go to the Initial Setting Level.
Press the Key to switch to another parameter.
Press and Keys simultaneously for at least 1 second to change between run and reset status.
Press the PF Key to change the digit (default setting).

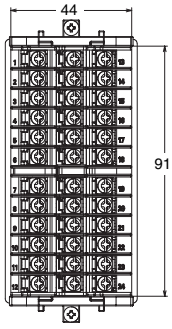
Dimensions

(Unit: mm)

Controllers

E5EC-T

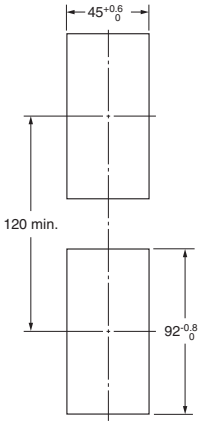




The Setup Tool ports are on the front and top of the Digital Temperature Controller. It is used to connect the Temperature Controller to the computer to use the Setup Tool. The E58-CIFQ2 USB-Serial Conversion Cable is required to make the connection. Refer to the instructions that are provided with the USB-Serial Conversion Cable for the connection procedure.

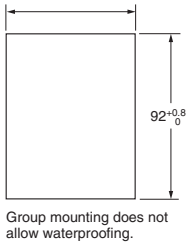
Note: Do not leave the USB-Serial Conversion Cable connected when you use the Temperature Controller.

Mounted Separately



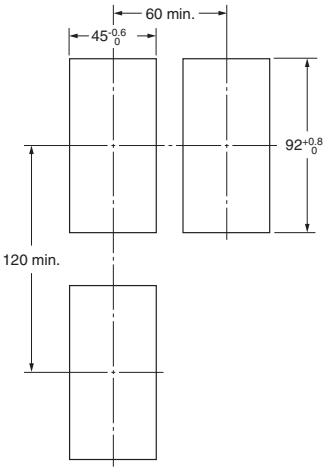
Group Mounted *

(48 × number of units – 2.5) +1.0 0

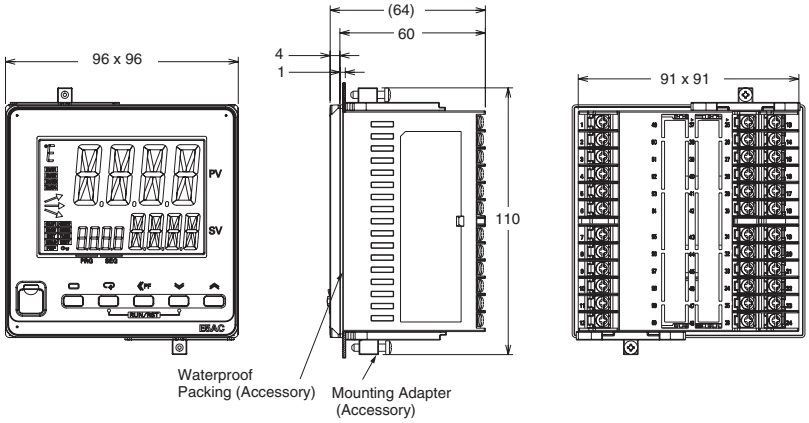


- Recommended panel thickness is 1 to 8 mm.
- Group mounting is not possible in the vertical direction. (Maintain the specified mounting space between Controllers.)
- To mount the Controller so that it is waterproof, insert the waterproof packing onto the Controller.
- When two or more Controllers are mounted, make sure that the surrounding temperature does not exceed the allowable operating temperature specified in the specifications.

* Selections for Control Outputs 1 and 2: QQ, QR, RR, CC, PR, or CQ
If you also specify 019, 021, 022 for the option selection and use group mounting, the ambient temperature must be 45°C or less.
If the ambient temperature is 55°C, maintain the following mounting spaces between Controllers.

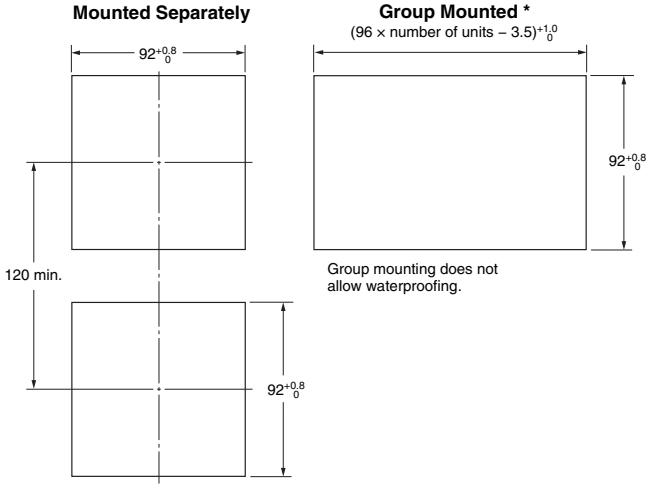


E5AC-T



The Setup Tool ports are on the front and top of the Digital Temperature Controller.
It is used to connect the Temperature Controller to the computer to use the Setup Tool.
The E58-CIFQ2 USB-Serial Conversion Cable is required to make the connection.
Refer to the instructions that are provided with the USB-Serial Conversion Cable for the connection procedure.

Note: Do not leave the USB-Serial Conversion Cable connected when you use the Temperature Controller.

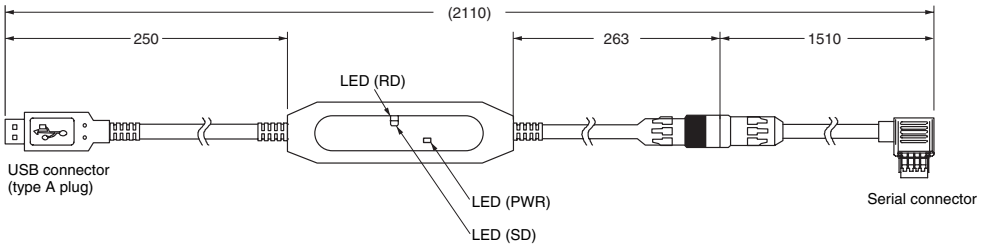


- Recommended panel thickness is 1 to 8 mm.
- Group mounting is not possible in the vertical direction. (Maintain the specified mounting space between Controllers.)
- To mount the Controller so that it is waterproof, insert the waterproof packing onto the Controller.
- When two or more Controllers are mounted, make sure that the surrounding temperature does not exceed the allowable operating temperature specified in the specifications.

Accessories (Order Separately)

● USB-Serial Conversion Cable

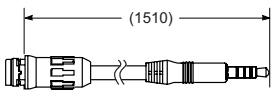
E58-CIFQ2



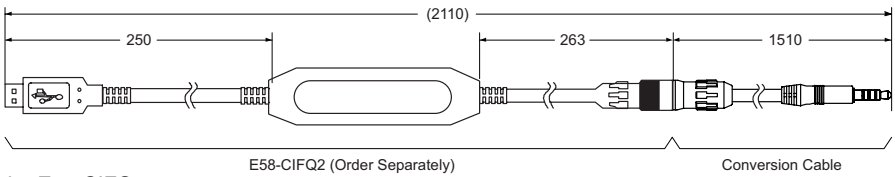
● Conversion Cable

E58-CIFQ2-E

Conversion Cable

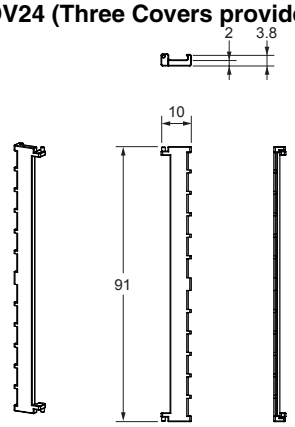


Connecting to the E58-CIFQ2 USB-Serial Conversion Cable

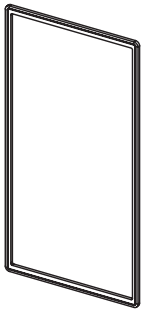


Note: Always use this product together with the E58-CIFQ2.

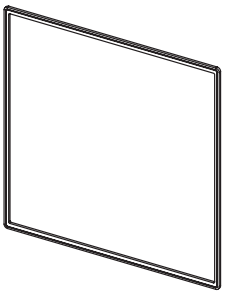
● **Terminal Covers**
E53-COV24 (Three Covers provided.)



● **Waterproof Packing**
Y92S-P9 (for DIN 48 × 96)

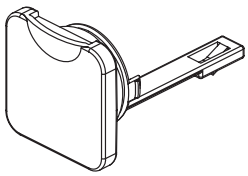


Y92S-P10 (for DIN 96 × 96)



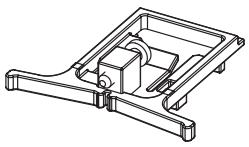
The Waterproof Packing is provided with the Temperature Controller.
Order the Waterproof Packing separately if it becomes lost or damaged.
The degree of protection when the Waterproof Packing is used is IP66.
Also, keep the Port Cover on the front-panel Setup Tool port of the E5EC-T/E5AC-T securely closed.
To maintain an IP66 degree of protection, the Waterproof Packing and the Port Cover for the front-panel Setup Tool port must be periodically replaced because they may deteriorate, shrink, or harden depending on the operating environment. The replacement period will vary with the operating environment.
Check the required period in the actual application.
Use 3 years or sooner as a guideline.
If a waterproof structure is not required, then the Waterproof Packing does not need to be installed.

● **Setup Tool Port Cover for top panel**
Y92S-P7



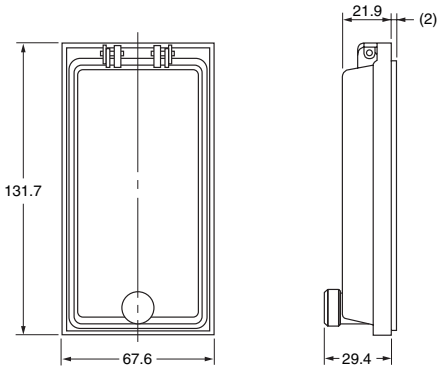
Order this Port Cover separately if the Port Cover on the front-panel Setup Tool port is lost or damaged. The Waterproof Packing must be periodically replaced because it may deteriorate, shrink, or harden depending on the operating environment.

● **Mounting Adapter**
Y92F-51 (Two Adapters provided.)

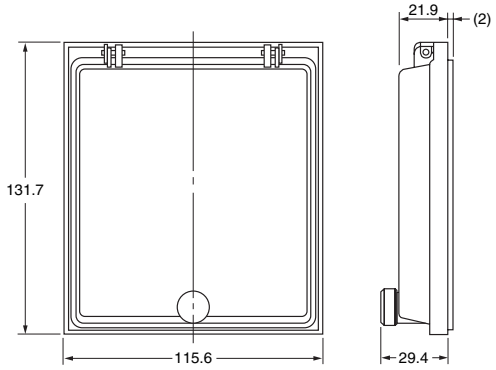


One pair is provided with the Controller.
Order this Adapter separately if it becomes lost or damaged.

● **Watertight Cover**
Y92A-49N (48 × 96)

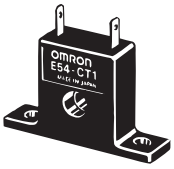


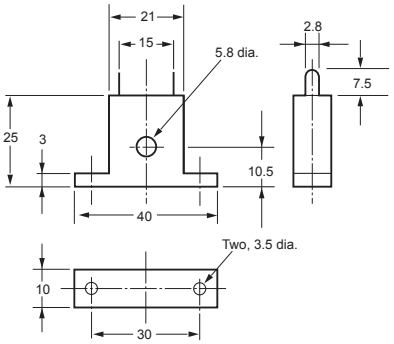
● **Watertight Cover**
Y92A-96N (96 × 96)



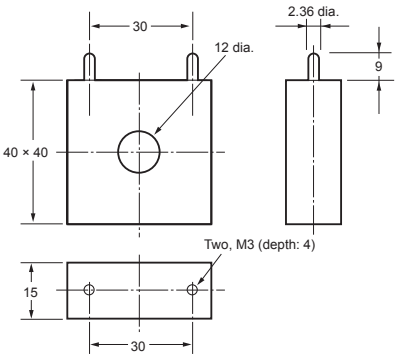
● Current Transformers

E54-CT1



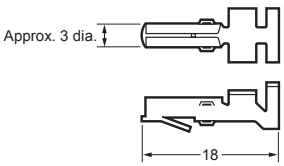


E54-CT3

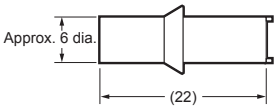


E54-CT3 Accessories

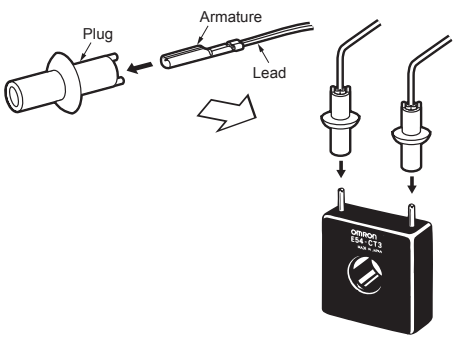
• Armature



• Plug

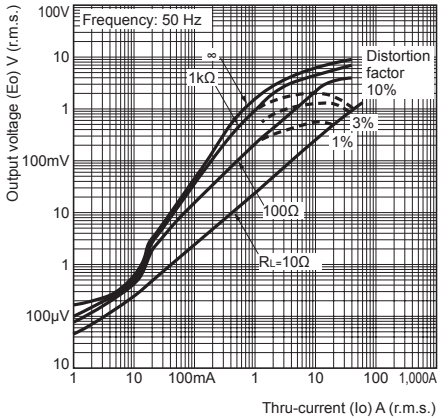


Connection Example



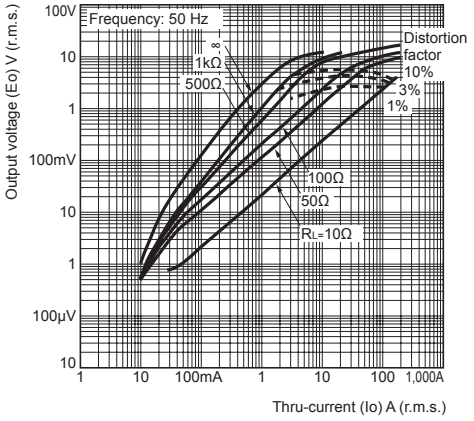
Thru-current (Io) vs. Output Voltage (Eo) (Reference Values)
E54-CT1

Maximum continuous heater current: 50 A (50/60 Hz)
Number of windings: 400±2
Winding resistance: 18±2 Ω



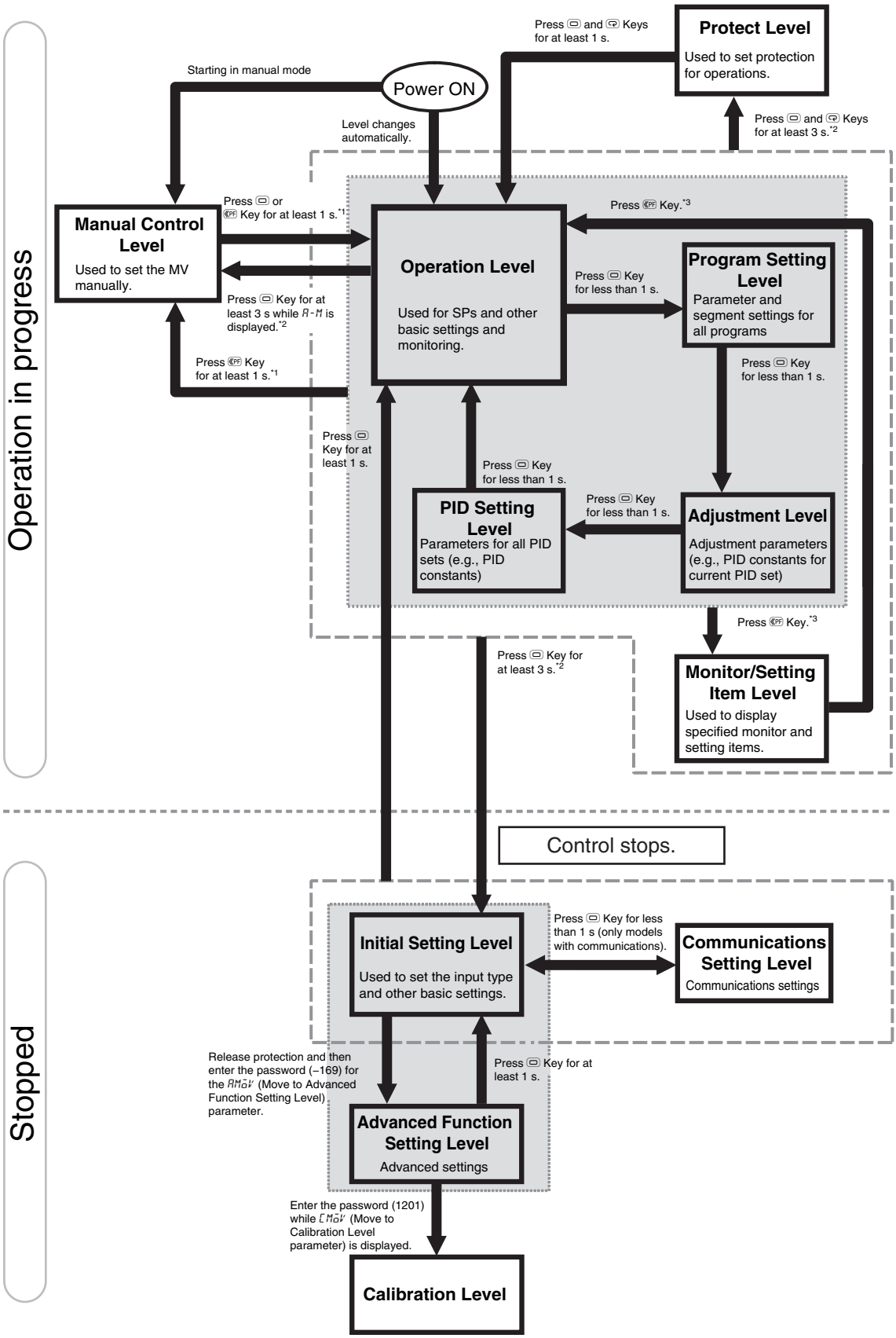
Thru-current (Io) vs. Output Voltage (Eo) (Reference Values)
E54-CT3

Maximum continuous heater current: 120 A (50/60 Hz)
(Maximum continuous heater current for an OMRON Digital Temperature Controller is 50 A.)
Number of windings: 400±2
Winding resistance: 8±0.8 Ω



E5□C-T

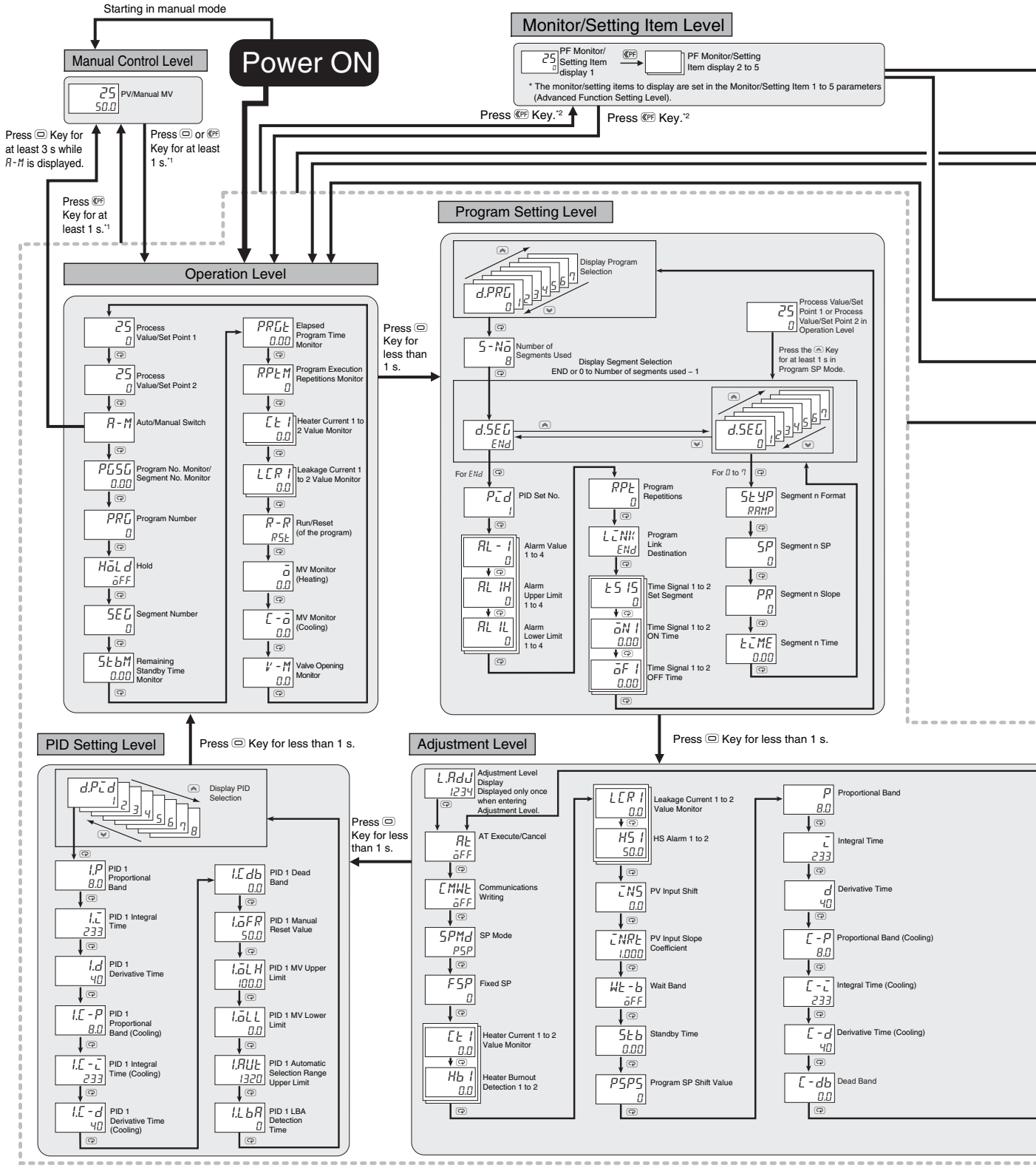
This diagram shows all of the setting levels. To move to the advanced function setting level and calibration level, you must enter passwords. Some parameters are not displayed depending on the protect level setting and the conditions of use.

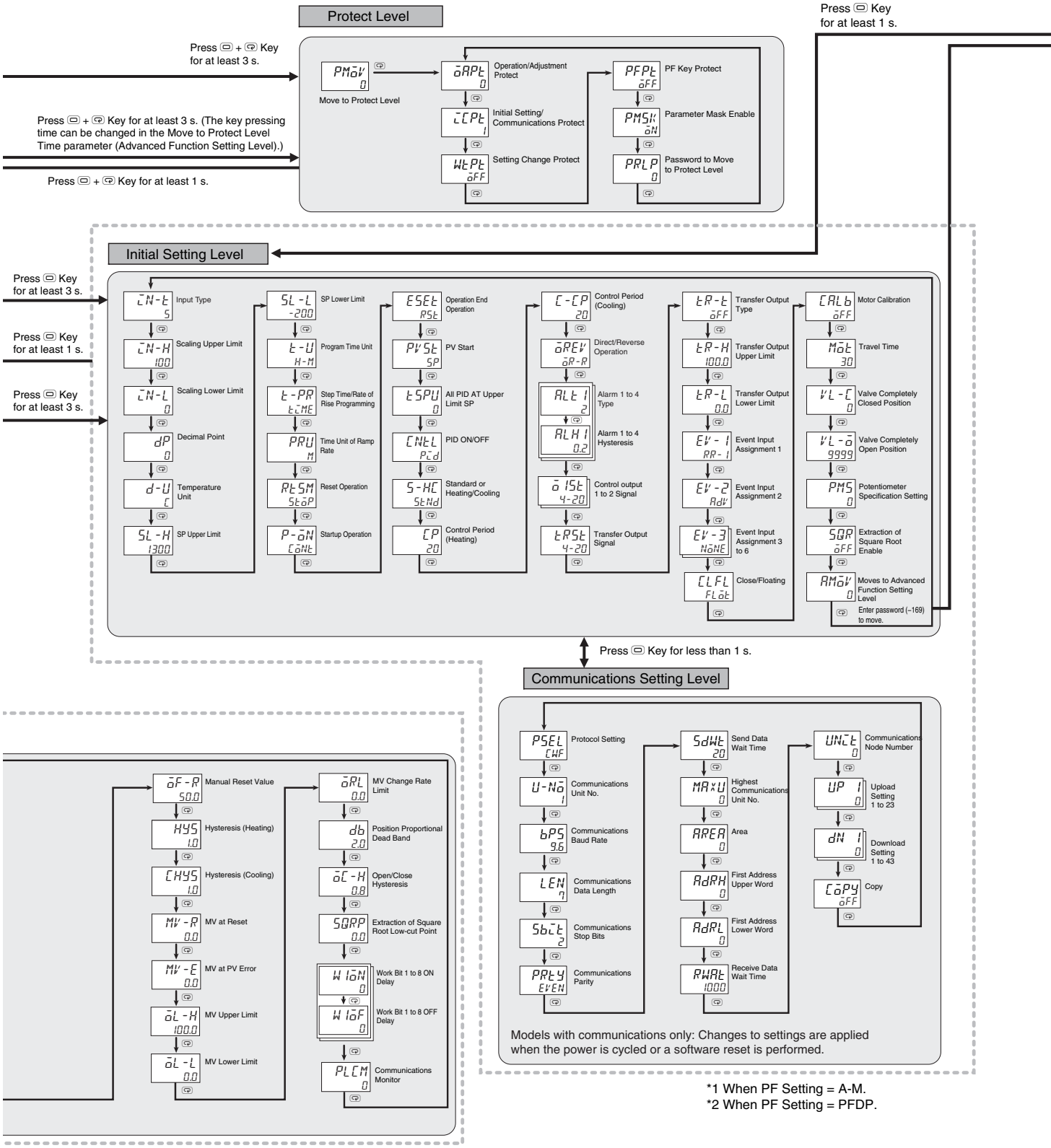

Operation in progress
Stopped
Starting in manual mode
Power ON
Level changes automatically.
Press ▭ and ▭ Keys for at least 1 s.
Protect Level
Used to set protection for operations.
Press ▭ and ▭ Keys for at least 3 s.*2
Manual Control Level
Used to set the MV manually.
Press ▭ or PF Key for at least 1 s.*1
Press PF Key.*3
Operation Level
Used for SPs and other basic settings and monitoring.
Press ▭ Key for less than 1 s.
Program Setting Level
Parameter and segment settings for all programs
Press ▭ Key for at least 3 s while R-M is displayed.*2
Press PF Key for at least 1 s.*1
Press ▭ Key for less than 1 s.
Press ▭ Key for at least 1 s.
Press ▭ Key for less than 1 s.
PID Setting Level
Parameters for all PID sets (e.g., PID constants)
Press ▭ Key for less than 1 s.
Adjustment Level
Adjustment parameters (e.g., PID constants for current PID set)
Press PF Key.*3
Press ▭ Key for at least 3 s.*2
Monitor/Setting Item Level
Used to display specified monitor and setting items.
Control stops.
Initial Setting Level
Used to set the input type and other basic settings.
Press ▭ Key for less than 1 s (only models with communications).
Communications Setting Level
Communications settings
Release protection and then enter the password (–169) for the RMOV (Move to Advanced Function Setting Level) parameter.
Press ▭ Key for at least 1 s.
Advanced Function Setting Level
Advanced settings
Enter the password (1201) while LMOV (Move to Calibration Level parameter) is displayed.
Calibration Level

*1 Set the PF Setting parameter to R-M (Auto/Manual).
*2 The No. 1 display will flash when the keys are pressed for 1 s or longer.
*3 Set the PF Setting parameter to PFDP (monitor/setting items).

E5□C-T

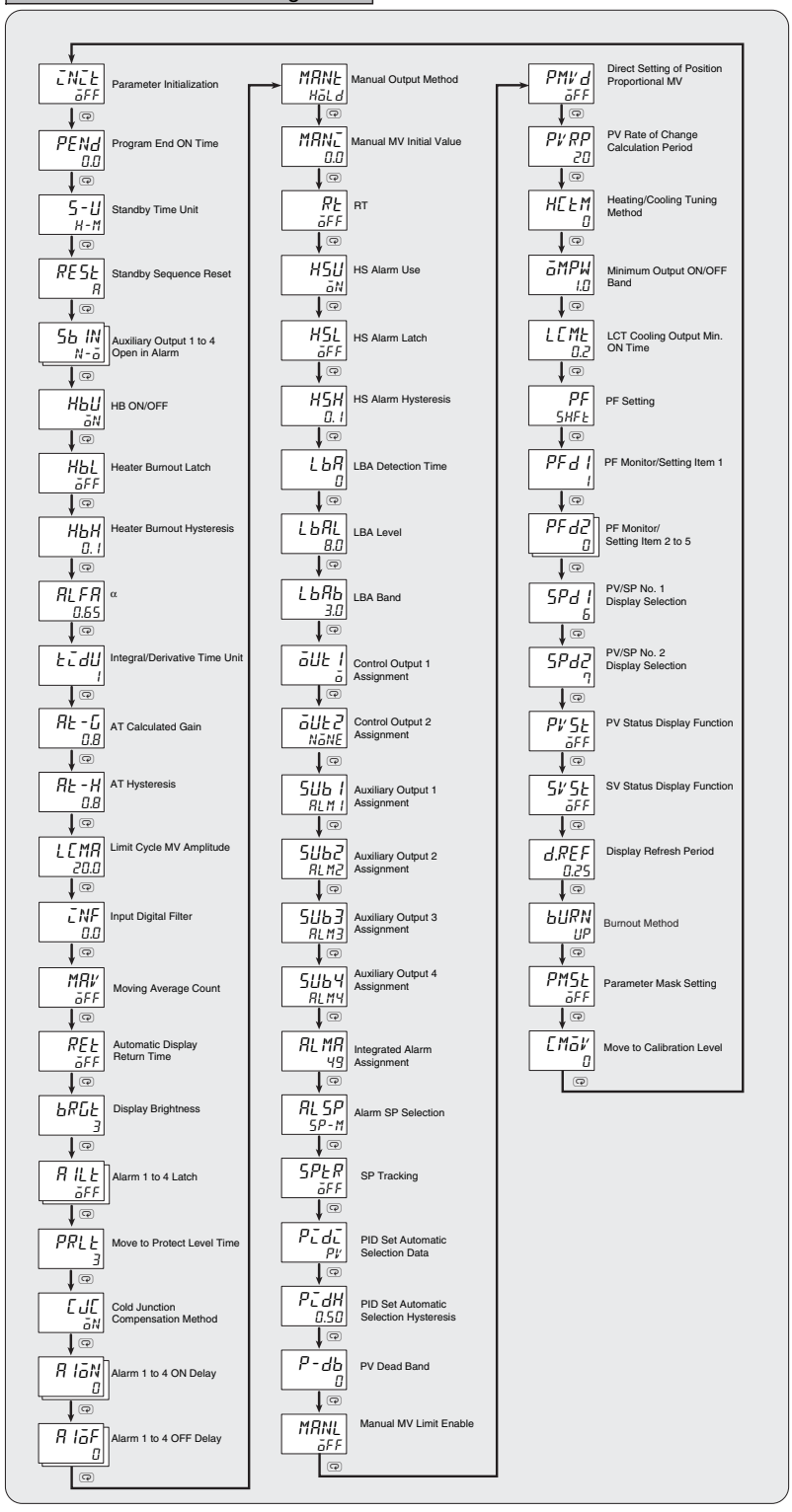
Some parameters may not be displayed depending on the model and other settings.


Starting in manual mode
Power ON
Manual Control Level
PV/Manual MV
Press Key for at least 3 s while A-M is displayed.
Press or Key for at least 1 s.*1
Press Key for at least 1 s.*1
Monitor/Setting Item Level
PF Monitor/ Setting Item display 1
PF Monitor/Setting Item display 2 to 5
* The monitor/setting items to display are set in the Monitor/Setting Item 1 to 5 parameters (Advanced Function Setting Level).
Press Key.*2
Press Key.*2
Program Setting Level
Operation Level
Process Value/Set Point 1
Process Value/Set Point 2
Auto/Manual Switch
Program No. Monitor/ Segment No. Monitor
Program Number
Hold
Segment Number
Remaining Standby Time Monitor
Elapsed Program Time Monitor
Program Execution Repetitions Monitor
Heater Current 1 to 2 Value Monitor
Leakage Current 1 to 2 Value Monitor
Run/Reset (of the program)
MV Monitor (Heating)
MV Monitor (Cooling)
Valve Opening Monitor
Press Key for less than 1 s.
Display Program Selection
Number of Segments Used
Display Segment Selection
END or 0 to Number of segments used – 1
Process Value/Set Point 1 or Process Value/Set Point 2 in Operation Level
Press the Key for at least 1 s in Program SP Mode.
For END
For 0 to 7
PID Set No.
Alarm Value 1 to 4
Alarm Upper Limit 1 to 4
Alarm Lower Limit 1 to 4
Program Repetitions
Program Link Destination
Time Signal 1 to 2 Set Segment
Time Signal 1 to 2 ON Time
Time Signal 1 to 2 OFF Time
Segment n Format
Segment n SP
Segment n Slope
Segment n Time
PID Setting Level
Press Key for less than 1 s.
Adjustment Level
Press Key for less than 1 s.
Display PID Selection
PID 1 Proportional Band
PID 1 Integral Time
PID 1 Derivative Time
PID 1 Proportional Band (Cooling)
PID 1 Integral Time (Cooling)
PID 1 Derivative Time (Cooling)
PID 1 Dead Band
PID 1 Manual Reset Value
PID 1 MV Upper Limit
PID 1 MV Lower Limit
PID 1 Automatic Selection Range Upper Limit
PID 1 LBA Detection Time
Press Key for less than 1 s.
Adjustment Level Display
Displayed only once when entering Adjustment Level.
AT Execute/Cancel
Communications Writing
SP Mode
Fixed SP
Heater Current 1 to 2 Value Monitor
Heater Burnout Detection 1 to 2
Leakage Current 1 to 2 Value Monitor
HS Alarm 1 to 2
PV Input Shift
PV Input Slope Coefficient
Wait Band
Standby Time
Program SP Shift Value
Proportional Band
Integral Time
Derivative Time
Proportional Band (Cooling)
Integral Time (Cooling)
Derivative Time (Cooling)
Dead Band


Protect Level
Press ▭ + ⟲ Key for at least 3 s.
Press ▭ + ⟲ Key for at least 3 s. (The key pressing time can be changed in the Move to Protect Level Time parameter (Advanced Function Setting Level).)
Press ▭ + ⟲ Key for at least 1 s.
Move to Protect Level
Operation/Adjustment Protect
Initial Setting/ Communications Protect
Setting Change Protect
PF Key Protect
Parameter Mask Enable
Password to Move to Protect Level
Press ▭ Key for at least 1 s.
Initial Setting Level
Press ▭ Key for at least 3 s.
Press ▭ Key for at least 1 s.
Press ▭ Key for at least 3 s.
Input Type
Scaling Upper Limit
Scaling Lower Limit
Decimal Point
Temperature Unit
SP Upper Limit
SP Lower Limit
Program Time Unit
Step Time/Rate of Rise Programming
Time Unit of Ramp Rate
Reset Operation
Startup Operation
Operation End Operation
PV Start
All PID AT Upper Limit SP
PID ON/OFF
Standard or Heating/Cooling
Control Period (Heating)
Control Period (Cooling)
Direct/Reverse Operation
Alarm 1 to 4 Type
Alarm 1 to 4 Hysteresis
Control output 1 to 2 Signal
Transfer Output Signal
Transfer Output Type
Transfer Output Upper Limit
Transfer Output Lower Limit
Event Input Assignment 1
Event Input Assignment 2
Event Input Assignment 3 to 6
Close/Floating
Motor Calibration
Travel Time
Valve Completely Closed Position
Valve Completely Open Position
Potentiometer Specification Setting
Extraction of Square Root Enable
Moves to Advanced Function Setting Level
Enter password (−169) to move.
Press ▭ Key for less than 1 s.
Communications Setting Level
Protocol Setting
Communications Unit No.
Communications Baud Rate
Communications Data Length
Communications Stop Bits
Communications Parity
Send Data Wait Time
Highest Communications Unit No.
Area
First Address Upper Word
First Address Lower Word
Receive Data Wait Time
Communications Node Number
Upload Setting 1 to 23
Download Setting 1 to 43
Copy
Models with communications only: Changes to settings are applied when the power is cycled or a software reset is performed.
Manual Reset Value
Hysteresis (Heating)
Hysteresis (Cooling)
MV at Reset
MV at PV Error
MV Upper Limit
MV Lower Limit
MV Change Rate Limit
Position Proportional Dead Band
Open/Close Hysteresis
Extraction of Square Root Low-cut Point
Work Bit 1 to 8 ON Delay
Work Bit 1 to 8 OFF Delay
Communications Monitor

*1 When PF Setting = A-M.
*2 When PF Setting = PFDP.

Advanced Function Setting Level



Error Displays (Troubleshooting)

When an error occurs, the No. 1 display or No. 2 display shows the error code.
Take necessary measure according to the error code, referring the following table.

Display	Name	Meaning	Action	Operation
5.ERR	Input error	The input value exceeded the control range.* The input type is not set correctly. The sensor is disconnected or short-circuited. The sensor is not wired correctly. The sensor is not wired. * Control Range Temperature resistance thermometer or thermocouple input: SP Lower Limit - 20°C to SP Upper Limit + 20°C (SP Lower Limit - 40°F to SP Upper Limit + 40°F) ESIB input: Same as specified input range. Analog input: Scaling range -5% to 105%	Check the wiring for input to be sure it is wired correctly, not broken, and not shorted. Also check the input type. If there are no problems in the wiring or input type settings, cycle the power supply. If the display remains the same, replace the Digital Temperature Controller. If the display is restored to normal, then the probable cause is external noise affecting the control system. Check for external noise. **Note:** For a temperature resistance thermometer, the input is considered disconnected if the A, B, or B' line is broken.	After the error occurs and it is displayed, the alarm output will operate as if the upper limit was exceeded. It will also operate as if transfer output exceeded the upper limit. If an input error is assigned to a control output or auxiliary output, the output will turn ON when the input error occurs. The error message will appear in the display for the PV. **Note: 1.** The heating and cooling control outputs will turn OFF. **2.** When the manual MV, MV at stop, MV at reset, or MV at error is set, the control output is determined by the set value.
cccc	Display range exceeded	Below -1,999 (This is not an error. It is displayed when the control range is wider than the display range and the PV exceeds the display range. The PV is displayed for the range that is given on the left (the number without the decimal point).)	-	Control continues and operation is normal. The value will appear in the display for the PV. Refer to the E5□C Digital Temperature Controllers User's Manual (Cat. No. H174) or the E5□C-T Digital Temperature Controllers Programmable Type User's Manual (Cat. No. H185) for information on the controllable range.
ɔɔɔɔ		Above 9,999 (This is not an error. It is displayed when the control range is wider than the display range and the PV exceeds the display range. The PV is displayed for the range that is given on the left (the number without the decimal point).)		
E333	A/D converter error	There is an error in the internal circuits.	After checking the input error, turn the power OFF then back ON again. If the display remains the same, the controller must be repaired. If the display is restored to normal, then a probable cause can be external noise affecting the control system. Check for external noise.	The control outputs, auxiliary outputs, and transfer outputs turn OFF. (A current output will be approx. 0 mA and a linear voltage output will be approx. 0V.)
E111	Memory error	There is an error in the internal memory operation.	First, cycle the power supply. If the display remains the same, the controller must be repaired. If the display is restored to normal, then a probable cause can be external noise affecting the control system. Check for external noise.	The control outputs, auxiliary outputs, and transfer outputs turn OFF. (A current output will be approx. 0 mA and a linear voltage output will be approx. 0V.)
FFFF	Overcurrent	This error is displayed when the peak current exceeds 55.0 A.	-	Control continues and operation is normal. The error message will appear for the following displays. Heater Current Value 1 Monitor Heater Current Value 2 Monitor Leakage Current Value 1 Monitor Leakage Current Value 2 Monitor
Ct1 Ct2 LCR1 LCR2	HB or HS alarm	If there is a HB or HS alarm, the No. 1 display will flash in the relevant setting level.	-	The No. 1 display for the following parameter flashes in Operation Level or Adjustment Level. Heater Current Value 1 Monitor Heater Current Value 2 Monitor Leakage Current Value 1 Monitor Leakage Current Value 2 Monitor However, control continues and operation is normal.
----	Potentiometer Input Error (Position-proportional Models Only)	"----" will be displayed for the Valve Opening Monitor parameter if any of the following error occurs. • Motor calibration has not been performed. • The wiring of the potentiometer is incorrect or broken. • The potentiometer input value is incorrect (e.g., the input is out of range or the potentiometer has failed).	Check for the above errors.	Close control: The control output is OFF or the value that is set for the MV at PV Error parameter is output. Floating control: Operation will be normal.

Safety Precautions

- **Be sure to read the precautions for all E5□C/E5□C-T models in the website at: http://www.ia.omron.com/.**

Warning Indications

⚠ CAUTION	**Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury or in property damage.**
Precautions for Safe Use	**Supplementary comments on what to do or avoid doing, to use the product safely.**
Precautions for Correct Use	**Supplementary comments on what to do or avoid doing, to prevent failure to operate, malfunction or undesirable effect on product performance.**

Meaning of Product Safety Symbols

	Used to warn of the risk of electric shock under specific conditions.
	Used for general prohibitions for which there is no specific symbol.
	Used to indicate prohibition when there is a risk of minor injury from electrical shock or other source if the product is disassembled.
	Used for general CAUTION, WARNING, or DANGER precautions for which there is no specified symbol. (This symbol is also used as the alerting symbol, but shall not be used in this meaning on the product.)
	Used for general mandatory action precautions for which there is no specified symbol.

⚠ CAUTION

Do not touch the terminals while power is being supplied.
Doing so may occasionally result in minor injury due to electric shock.

Electric shock may occur. Do not touch any cables or connectors with wet hands.

Electric shock, fire, or malfunction may occasionally occur. Do not allow metal objects, conductors, cuttings from installation work, or moisture to enter the Digital Temperature Controller or the Setup Tool port or ports. Attach the cover to the front-panel Setup Tool port whenever you are not using it to prevent foreign objects from entering the port.

Do not use the Digital Temperature Controller where subject to flammable or explosive gas. Otherwise, minor injury from explosion may occasionally occur.

Not doing so may occasionally result in fire. Do not allow dirt or other foreign objects to enter the Setup Tool port or ports, or between the pins on the connectors on the Setup Tool cable.

Minor electric shock or fire may occasionally occur. Do not use any cables that are damaged.

Never disassemble, modify, or repair the product or touch any of the internal parts. Minor electric shock, fire, or malfunction may occasionally occur.

CAUTION - Risk of Fire and Electric Shock

a. This product is UL listed*1 as Open Type Process Control Equipment. It must be mounted in an enclosure that does not allow fire to escape externally.
b. More than one disconnect switch may be required to de-energize the equipment before servicing the product.
c. Signal inputs are SELV, limited energy. *2
d. Caution: To reduce the risk of fire or electric shock, do not interconnect the outputs of different Class 2 circuits. *3

If the output relays are used past their life expectancy, contact fusing or burning may occasionally occur. Always consider the application conditions and use the output relays within their rated load and electrical life expectancy. The life expectancy of output relays varies considerably with the output load and switching conditions.

Even if you replace only the Main Unit of the E5DC, check the condition of the Terminal Unit.
If corroded terminals are used, contact failure in the terminals may cause the temperature inside the Digital Temperature Controller to increase, possibly resulting in fire.
If the terminals are corroded, replace the Terminal Unit as well.

Tighten the terminal screws to the rated torque of between 0.43 and 0.58 N•m. *4
Loose screws may occasionally result in fire.

Set the parameters of the product so that they are suitable for the system being controlled. If they are not suitable, unexpected operation may occasionally result in property damage or accidents.

A malfunction in the product may occasionally make control operations impossible or prevent alarm outputs, resulting in property damage.
To maintain safety in the event of malfunction of the product, take appropriate safety measures, such as installing a monitoring device on a separate line.

*1. E5CC, E5EC, E5AC, and E5DC Digital Temperature Controllers that were shipped through November 2013 are UL recognized.
*2. An SELV (separated extra-low voltage) system is one with a power supply that has double or reinforced insulation between the primary and the secondary circuits and has an output voltage of 30 V r.m.s. max. and 42.4 V peak max. or 60 VDC max.
*3. A class 2 circuit is one tested and certified by UL as having the current and voltage of the secondary output restricted to specific levels.
*4. The specified torque is 0.5 N·m for the E5CC-U.

Precautions for Safe Use

Be sure to observe the following precautions to prevent malfunction or adverse affects on the performance or functionality of the product. Not doing so may occasionally result in faulty operation. Do not handle the Digital Temperature Controller in ways that exceed the ratings.

1. This product is specifically designed for indoor use only.
   Do not use this product in the following places:
   - Places directly subject to heat radiated from heating equipment.
   - Places subject to splashing liquid or oil atmosphere.
   - Places subject to direct sunlight.
   - Places subject to dust or corrosive gas (in particular, sulfide gas and ammonia gas).
   - Places subject to intense temperature change.
   - Places subject to icing and condensation.
   - Places subject to vibration and large shocks.
2. Use and store the product within the rated ambient temperature and humidity.
   Gang-mounting two or more Digital Temperature Controllers, or mounting Digital Temperature Controllers above each other may cause heat to build up inside the Digital Temperature Controllers, which will shorten their service life. In such a case, use forced cooling by fans or other means of air ventilation to cool down the Digital Temperature Controllers.
3. To allow heat to escape, do not block the area around the Digital Temperature Controller.
   Do not block the ventilation holes on the Digital Temperature Controller.
4. Be sure to wire properly with correct signal name and polarity of terminals.
5. Use the specified size of crimped terminals (M3, width of 5.8 mm or less) to wire the E5CC, E5EC, E5AC, E5DC, or E5□C-T. To connect bare wires to the terminal block of the E5CC, E5EC, E5AC, E5DC, or E5□C-T, use copper braided or solid wires with a gage of AWG24 to AWG18 (equal to a cross-sectional area of 0.205 to 0.823 mm^2). (The stripping length is 6 to 8 mm.) Up to two wires of the same size and type, or two crimped terminals can be inserted into a single terminal.
   Use the specified size of crimped terminals (M3.5, width of 7.2 mm or less) to wire the E5CC-U. To connect bare wires to the terminal block of the E5CC-U, use copper braided or solid wires with a gage of AWG24 to AWG14 (equal to a cross-sectional area of 0.205 to 2.081 mm^2). (The stripping length is 5 to 6 mm.) Up to two wires of the same size and type, or two crimped terminals can be inserted into a single terminal.
   Use the specified size of crimped terminals (M3, width of 5.8 mm or less) to wire the E5GC.*
   To connect bare wires to the terminal block of the E5GC, use copper braided or solid wires with a gauge of AWG24 to AWG18 (equal to a cross-sectional area of 0.205 to 0.823 mm2). (The stripping length for Digital Temperature Controllers with screw terminal blocks is 6 to 8 mm. The stripping length for Digital Temperature Controllers with screwless clamp terminal blocks is 8 to 12 mm.)
   Up to two wires of the same size and type, or two crimped terminals can be inserted into a single terminal. When connecting two wires into one terminal of a Digital Temperature Controller with a screwless clamp terminal block, use ferrules with a diameter of 0.8 to 1.4 mm and an exposed conductor length of 8 to 12 mm that two wires are crimped for a ferrule.*
   * The Digital Temperature Controller with screwless clamp terminals underwent UL testing with one braided wire connected.
6. Do not wire the terminals that are not used.
7. Use a commercial power supply for the power supply voltage input to a Digital Temperature Controller with AC input specifications. Do not use the output from an inverter as the power supply. Depending on the output characteristics of the inverter, temperature increases in the Digital Temperature Controller may cause smoke or fire damage even if the inverter has a specified output frequency of 50/60 Hz.
8. To avoid inductive noise, keep the wiring for the product's terminal block away from power cables carry high voltages or large currents. Also, do not wire power lines together with or parallel to product wiring. Using shielded cables and using separate conduits or ducts is recommended.
   Attach a surge suppressor or noise filter to peripheral devices that generate noise (in particular, motors, transformers, solenoids, magnetic coils, or other equipment that have an inductance component).
   When a noise filter is used at the power supply, first check the voltage or current, and attach the noise filter as close as possible to the product.
   Allow as much space as possible between the product and devices that generate powerful high frequencies (high-frequency welders, high-frequency sewing machines, etc.) or surge.
9. Use this product within the rated load and power supply.
10. Make sure that the rated voltage is attained within two seconds of turning ON the power using a switch or relay contact. If the voltage is applied gradually, the power may not be reset or output malfunctions may occur.
11. Make sure that the Digital Temperature Controller has 30 minutes or more to warm up after turning ON the power before starting actual control operations to ensure the correct temperature display.
12. When executing self-tuning with E5□C, turn ON power to the load (e.g., heater) at the same time as or before supplying power to the product. If power is turned ON to the product before turning ON power to the load, self-tuning will not be performed properly and optimum control will not be achieved.
13. A switch or circuit breaker must be provided close to the product. The switch or circuit breaker must be within easy reach of the operator, and must be marked as a disconnecting means for this unit.
14. Use a soft and dry cloth to clean the product carefully. Do not use organic solvent, such as paint thinner, benzine or alcohol to clean the product.
15. Design the system (e.g., control panel) considering the 2 seconds of delay that the product's output to be set after power ON.
16. The output may turn OFF when you move to the initial setting level. Take this into consideration when performing control operations.
17. The number of non-volatile memory write operations is limited. Therefore, use RAM write mode when frequently overwriting data during communications or other operations.
18. Always touch a grounded piece of metal before touching the Digital Temperature Controller to discharge static electricity from your body.
19. Use suitable tools when taking the Digital Temperature Controller apart for disposal. Sharp parts inside the Digital Temperature Controller may cause injury.
20. For compliance with Lloyd's standards, the E5CC, E5CC-U, E5EC, and E5AC must be installed under the conditions that are specified in *Shipping Standards*.
21. For the Digital Temperature Controller with two Setup Tool ports (E5EC/E5AC/E5DC/E5GC), do not connect cables to both ports at the same time. The Digital Temperature Controller may be damaged or may malfunction.
22. Do not place heavy object on the Conversion Cable, bend the cable past its natural bending radius, or pull on the cable with undue force.
23. Do not disconnect the Communications Conversion Cable or the USB-Serial Conversion Cable while communications are in progress. Damage or malfunction may occur.
24. Do not touch the external power supply terminals or other metal parts on the Digital Temperature Controller.
25. Refer to the E5□C Digital Temperature Controllers User's Manual (Cat. No. H174) for information on the communications distances and cables for the E5□C.
    For details on the E5□C-T, refer to the *E5□C-T Digital Temperature Controllers Programmable Type User's Manual* (Cat. No. H185).
26. Do not bend the communications cables past their natural bending radius. Do not pull on the communications cables.
27. Do not turn the power supply to the Digital Temperature Controller ON or OFF while the USB-Serial Conversion Cable is connected. The Digital Temperature Controller may malfunction.
28. Make sure that the indicators on the USB-Serial Conversion Cable are operating properly. Depending on the application conditions, deterioration in the connectors and cable may be accelerated, and normal communications may become impossible. Perform periodic inspection and replacement.
29. Connectors may be damaged if they are inserted with excessive force. When connecting a connector, always make sure that it is oriented correctly. Do not force the connector if it does not connect smoothly.

30. Noise may enter on the USB-Serial Conversion Cable, possibly causing equipment malfunctions. Do not leave the USB-Serial Conversion Cable connected constantly to the equipment.
31. For the E5DC, when you attach the Main Unit to the Terminal Unit, make sure that the hooks on the Main Unit are securely inserted into the Terminal Unit.
32. For the E5CC-U, when you attach the Main Unit to the socket, make sure that the hooks on the socket are securely inserted into the Main Unit.
33. Install the DIN Track vertically to the ground.
34. For the E5DC, always turn OFF the power supply before connecting the Main Unit to or disconnecting the Main Unit from the Terminal Unit, and never touch nor apply shock to the terminals or electronic components. When connecting or disconnecting the Main Unit, do not allow the electronic components to touch the case.
35. Observe the following precautions when you remove the terminal block or pulling out the interior of the product of the E5GC.
- Always follow the instructions provided in the E5□C Digital Temperature Controllers User's Manual (Cat. No. H174).
- Turn OFF the power supply before you start and never touch nor apply shock to the terminals or electric components. When you insert the interior body of the Digital Temperature Controller, do not allow the electronic components to touch the case.
- Check for any corrosion on the terminals.
- When you insert the interior body into the rear case, confirm that the hooks on the top and bottom are securely engaged with the case.

Shipping Standards

The E5CC, E5CC-U, E5EC, and E5AC comply with Lloyd's standards. When applying the standards, the following installation requirements must be met in the application.

Application Conditions

● Installation Location

The E5CC, E5CC-U, E5EC, and E5AC comply with installation category ENV1 and ENV2 of Lloyd's standards. Therefore, they must be installed in a location equipped with air conditioning. They cannot be used on the bridge or decks, or in a location subject to strong vibration.

Precautions for Correct Use

● Service Life

1. Use the product within the following temperature and humidity ranges:
Temperature: -10 to 55°C (with no icing or condensation)
Humidity: 25% to 85%
If the product is installed inside a control board, the ambient temperature must be kept to under 55°C, including the temperature around the product.
2. The service life of electronic devices like Digital Temperature Controllers is determined not only by the number of times the relay is switched but also by the service life of internal electronic components. Component service life is affected by the ambient temperature: the higher the temperature, the shorter the service life and, the lower the temperature, the longer the service life. Therefore, the service life can be extended by lowering the temperature of the Digital Temperature Controller.
3. When two or more Digital Temperature Controllers are mounted horizontally close to each other or vertically next to one another, the internal temperature will increase due to heat radiated by the Digital Temperature Controllers and the service life will decrease. In such a case, use forced cooling by fans or other means of air ventilation to cool down the Digital Temperature Controllers. When providing forced cooling, however, be careful not to cool down the terminals sections alone to avoid measurement errors.

● Measurement Accuracy

1. When extending or connecting the thermocouple lead wire, be sure to use compensating wires that match the thermocouple types.
2. When extending or connecting the lead wire of the platinum resistance thermometer, be sure to use wires that have low resistance and keep the resistance of the three lead wires the same.
3. Mount the product so that it is horizontally level.
4. If the measurement accuracy is low, check to see if input shift has been set correctly.

● Waterproofing (Not applicable to the E5CC-U/E5DC.)

The degree of protection is as shown below. Sections without any specification on their degree of protection or those with IP□0 are not waterproof.

Front panel: IP66, Rear case: IP20, Terminal section: IP00

When waterproofing is required, insert the Waterproof Packing on the backside of the front panel. Keep the Port Cover on the front-panel Setup Tool port of the E5EC/E5AC/E5EC-T/E5AC-T securely closed. The degree of protection when the Waterproof Packing is used is IP66. To maintain an IP66 degree of protection, the Waterproof Packing and the Port Cover for the front-panel Setup Tool port must be periodically replaced because they may deteriorate, shrink, or harden depending on the operating environment. The replacement period will vary with the operating environment. Check the required period in the actual application. Use 3 years or sooner as a guideline. If the Waterproof Packing and Port Cover are not periodically replaced, waterproof performance may not be maintained. If a waterproof structure is not required, then the Waterproof Packing does not need to be installed.

● Operating Precautions

1. When using self-tuning, turn ON power for the load (e.g., heater) at the same time as or before supplying power to the Digital Temperature Controller. If power is turned ON for the Digital Temperature Controller before turning ON power for the load, self-tuning will not be performed properly and optimum control will not be achieved.
When starting operation after the Digital Temperature Controller has warmed up, turn OFF the power and then turn it ON again at the same time as turning ON power for the load. (Instead of turning the Digital Temperature Controller OFF and ON again, switching from STOP mode to RUN mode can also be used.)
2. Avoid using the Digital Temperature Controller in places near a radio, television set, or wireless installing. These devices can cause radio disturbances which adversely affect the performance of the Controller.

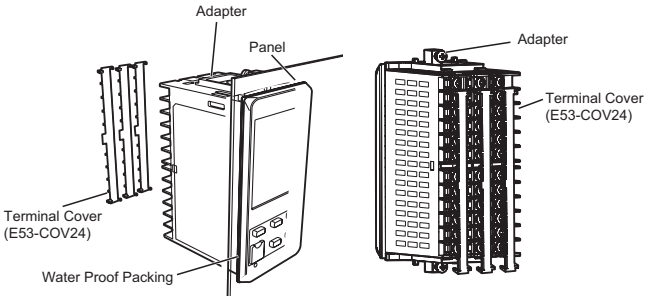
● Others

1. Do not Connect or disconnect the Conversion Cable connector repeatedly over a short period of time.
The computer may malfunction.
2. After connecting the Conversion Cable to the computer, check the COM port number before starting communications. The computer requires time to recognize the cable connection. This delay does not indicate failure.
3. Do not connect the Conversion Cable through a USB hub. Doing so may damage the Conversion Cable.
4. Do not use an extension cable to extend the Conversion Cable length when connecting to the computer. Doing so may damage the Conversion Cable.

● Mounting

Mounting to a Panel

E5EC-T/E5AC-T

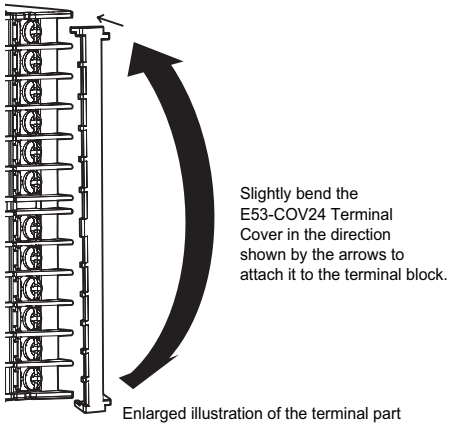


1. For waterproof mounting, waterproof packing must be installed on the Digital Temperature Controller. Waterproofing is not possible when group mounting several Digital Temperature Controllers. Waterproof packing is not necessary when there is no need for the waterproofing function.
2. Insert the E5EC/E5AC/E5EC-T/E5AC-T into the mounting hole in the panel.
3. Push the adapter from the terminals up to the panel, and temporarily fasten the E5EC/E5AC/E5EC-T/E5AC-T.
4. Tighten the two fastening screws on the adapter. Alternately tighten the two screws little by little to maintain a balance. Tighten the screws to a torque of 0.29 to 0.39 N·m.

Mounting the Terminal Cover

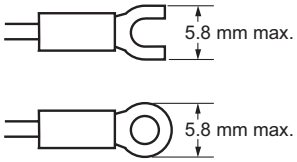
E5EC-T/E5AC-T

Slightly bend the E53-COV24 Terminal Cover to attach it to the terminal block as shown in the following diagram. The Terminal Cover cannot be attached in the opposite direction.

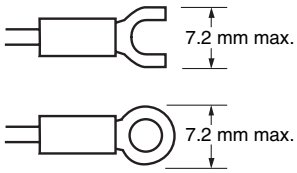

Slightly bend the
E53-COV24 Terminal
Cover in the direction
shown by the arrows to
attach it to the terminal block.
Enlarged illustration of the terminal part

● Precautions when Wiring

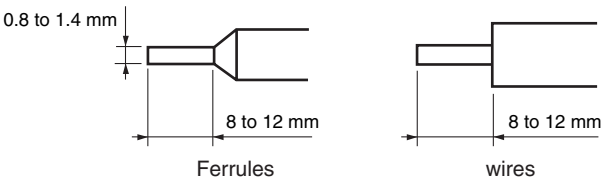
- Separate input leads and power lines in order to prevent external noise.
- Use a shielded, AWG24 to AWG18 (cross-sectional area of 0.205 to 0.8231 mm^2) twisted-pair cable. Use a shielded, AWG24 to AWG14 (cross-sectional area of 0.205 to 2.081 mm^2) twisted-pair cable for the E5CC-U. The stripping length is 6 to 8 mm for the E5CC, E5EC, E5AC, E5DC, or E5CC-T and 5 to 6 mm for the E5CC-U.
  The E5GC stripping length is 6 to 8 mm for models with screw terminal blocks and 8 to 12 mm for models with screwless clamp terminal blocks.
- Use crimp terminals when wiring the terminals.
- Use the suitable wiring material and crimp tools for crimp terminals.
- Tighten the terminal screws to a torque of 0.43 to 0.58 N·m.
  The specified torque is 0.5 N·m for the E5CC-U.
- For the E5GC, E5CC, E5EC, E5AC, E5DC, or E5□C-T, use the following types of crimp terminals for M3 screws.



- For the E5CC-U, use the following types of crimp terminals for M3.5 screws.



- For E5GC Controllers with screwless clamp terminal blocks, use braided or solid wires with a gauge of AWG24 to AWG18 (equal to a cross-sectional area of 0.205 to 0.823 mm^2).
  The length of the conductive portion inserted into the terminal must be 8 to 12 mm. Ferrules must be 0.8 to 1.4 mm in diameter..



- Recommended Ferrules for E5GC Screwless Clamp Terminals

Manufacturer		Model number
Altech Corp.		2623.0
Daido Solderless Terminal Mfg. Co.		AVA-0.5
J.S.T. Mfg. Co.		TUB-0.5
Nichifu Co.	Single (1 wire)	TGNTC-1.25-9T TGVTC-1.25-11T TGNTC-1.25-11T TC0.3-9.5 TC1.25-11S-ST TC1.25-11S TC2-11S
	Double (2 wires)	TGWVTC-1.25-9T TGWVTC-1.25-11T

Three-year Guarantee

● Period of Guarantee

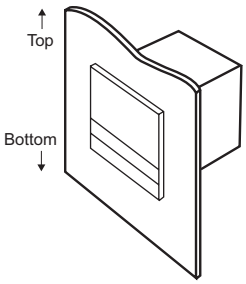
The guarantee period of the Unit is three years starting from the date the Unit is shipped from the factory.

Scope of Guarantee

The Unit is guaranteed under the following operating conditions.

1. Average Operating Temperature (see note): −10°C to 50°C

2. Mounting Method: Standard mounting



Note: Average Operating Temperature
Refer to the process temperature of the Unit mounted to a control panel and connected to peripheral devices on condition that the Unit is in stable operation, sensor input type K is selected for the Unit, the positive and negative thermocouple input terminals of the Unit are short-circuited, and the ambient temperature is stable.

Should the Unit malfunction during the guarantee period, OMRON shall repair the Unit or replace any parts of the Unit at the expense of OMRON.

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